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YANNICK CORMIER

"I've been a photographer for about 15 years, the past 10 in India. Today, my work is mostly about what has been forgotten by the Indian economic miracle—low-caste peoples, the conflict in Kashmir, drug addictions in Kolkata. In 2010, a fellow photographer invited me to attend the Koovagam festival, which is dedicated to the *hijra* community. Meeting hijras was a shock to me because of the strong contrast between their sexual freedom and the extremely puritan ways of the rest of Indian society. Given that I already focused on communities that have suffered from both modernity and British colonialism, documenting hijras made perfect sense, as they are in a similar situation. It was at Koovagam that I met Malaika. Several photographers were at this ordinary restaurant, and she popped in and suddenly the whole room froze and stared at her. We've kept in touch ever since. I spent three days in December with Malaika for this project, which was the first time I'd worked with a single individual instead of an entire community. Usually, I try to capture the total essence of a person through a single picture. But this time, I was able to define Malaika's life and personality through a whole series." **P. 14**

Paul Rimple is a freelance journalist based in Tbilisi, Georgia, where he has lived for about 10 years. A former research scholar at the Wilson Center, he has been published by *EurasiaNet*, Time.com, the *Christian Science Monitor*, and the *Moscow Times*. He also fronts The Natural Born Lovers, a Georgia-based blues band.



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Scott C. Johnson spent more than a decade as a *Newsweek* correspondent, reporting from Iraq, Afghanistan, and Mexico, among other places. He also served as the magazine's bureau chief in Africa. Johnson's first book, *The Wolf and the Watchman*, was published in 2012 and chronicles his childhood as the son of a CIA spy.



Jillian Keenan has reported from Somalia, Kazakhstan, Niger, Cuba, and, for her latest in Foreign Policy, Burundi. Her work has been published by the *New York Times*, the *New Yorker*, *Slate*, and the *Washington Post*, among other publications. A freelance journalist, Keenan is also working on a book about Shakespeare and global sexuality.





ARE MUSLIMS WELCOME IN MODI'S INDIA?

In 2014, Prime Minister Narendra Modi swept to power with a stunning mandate to promote economic growth and development. But his Hindu nationalist party—and his ties to paramilitary forces—have some worried that India's future will be dark for the world's second-largest Muslim population. Read FP contributing editor James Traub's investigation into the new India.

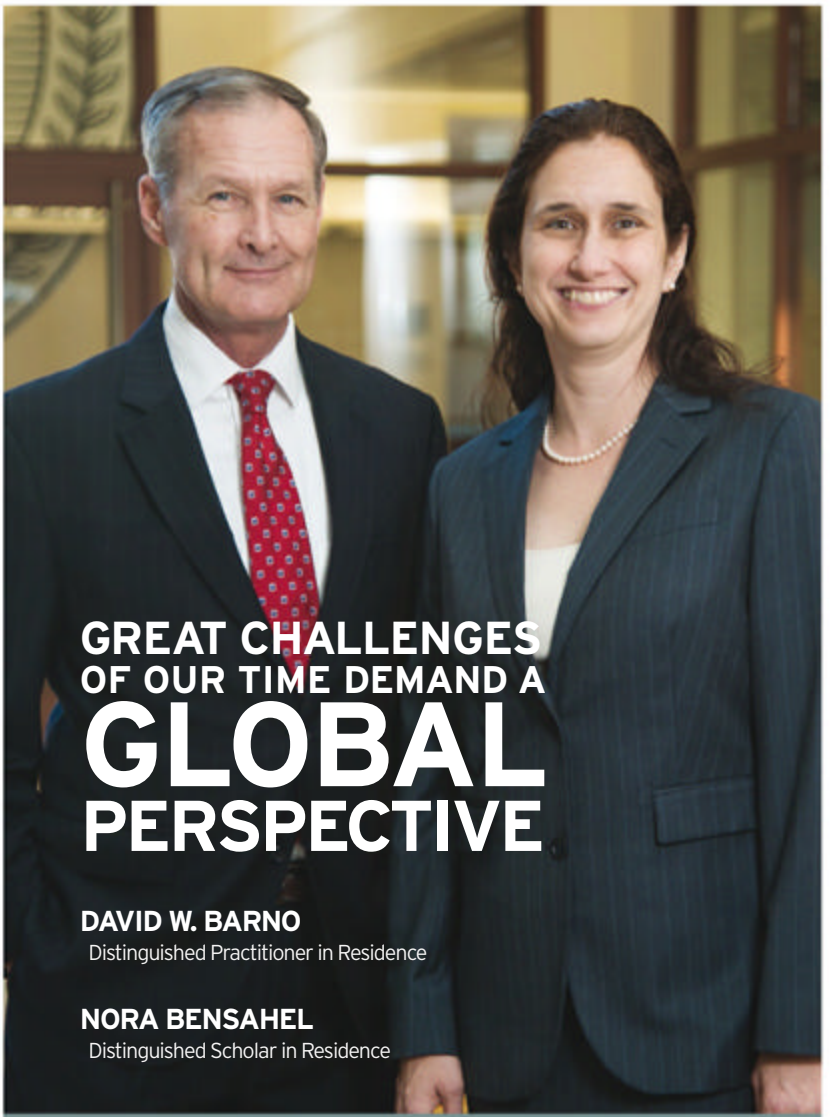
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Malthus and Murder

Burundi, which emerged from a bloody civil war 10 years ago, has too many people squeezed onto too little land. Visit ForeignPolicy.com for arresting pictures of the tiny country from award-winning photographer Martina Bacigalupo.



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Images of India's *hijras*, both targeted and revered, show an ancient community still finding its place. | P. 14

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A Viking re-enactor needs imagination—and even more chain mail. | P. 22

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MALAIKA HAS ALWAYS CONSIDERED HERSELF A WOMAN

"Malaika has always considered herself a woman." | P. 14

Lettering by O BANQUINHO





In Transition

Malaika has always considered herself a woman. And eight years ago, at age 22—after some 12 plastic surgeries and a series of hormone treatments—her body finally matched her identity. Today she's among the hundreds of thousands in India who identify as *hijra*, comprising a community of eunuchs, cross-dressers, and transgender people.

Revered for centuries in South Asian culture, the hijra population was criminalized under colonial rule. Since then, hijras have been targets of police violence and discrimination, but they've also managed to maintain certain esteemed social roles. Last year, the Indian Supreme Court recognized hijras' right to identify as a third gender.

Unsurprisingly, perhaps, this charged history has created tight networks among hijras. In the city of Chennai, Malaika—known widely by only her first name—is more than just a "respected member of a united community," says French photographer Yannick Cormier. She serves as both a mentor and matriarch within it.



Her daily routine is well established: Each morning she washes the dishes used to perform a *puja*, or ritual prayer, to the Hindu goddess Kali—an incarnation of feminine energy.





Malaika has lived in the Royapuram neighborhood all her life. To stay in the loop on the comings and goings of those around her housing complex, Malaika meets with neighbors and monitors concerns about living conditions and other community issues.

While close-knit, the hijra community is also very hierarchical. Malaika is a "queen"—others are "gurus," older members who often supervise queens, or "apprentices," younger people who have yet to undergo sex-reassignment procedures—a distinction that commands respect even outside her hijra network. Consequently, she is often asked to mediate local disputes. Here, Malaika arbitrates a family fight after the daughter (left) accuses her father (arm outstretched at right) of molestation. Malaika gives him an ultimatum: If he sexually abuses the girl again, Malaika will inform the police.





Diadana is one of Malaika's protégés. Both Diadana and Malaika make a living in sex work, a profession that attracts many hijras, who often face employment discrimination in mainstream sectors. Here, Diadana applies makeup before meeting a client.

As part of her duties as a queen, Malaika acts as an informal guardian for younger hijras, such as Rexona. She offers them personal and professional guidance and may even help raise money for cosmetic surgery and other treatments required for transitioning.

One of Malaika's apprentices, unidentified, covers her face.





Syncretism is common in India; Malaika converted from Hinduism to Christianity about a year ago, but she continues to perform certain rituals of her old religion. Here, standing next to one of her neighbor's daughters, she adjusts her sari before going to temple to perform her daily puja.





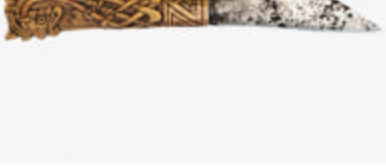
At a festival, Malaika honors Shiva, one of the most important deities in the Hindu faith.

The Historical Re-enactor
Kim Siddorn











1

Padded arming cap
This has its own ventail, which is the chain mail to protect the neck from blows. You pull it on, tie the straps over your beard, then jam a helmet on top. I use this to add padding when I'm wearing a helmet that's a little large.

2

Dice box and dice
A friend made the box for me out of cow bone. The dice are made out of whale bone. It's good to have things to take out of your pocket and wave at the crowd. Vikings certainly would have used the dice to gamble.

3

Viking knife
This blade is 1,000 years old. It was found in the Thames by a re-enactor who uses a metal detector to find buried artifacts. I use it as a general-purpose knife for cutting string or meat, as the Vikings would have.

4

Sword
It's tied into the scabbard so that by the time a man unties the sword, he will have had time to consider whether he wants to whack someone with it. I use this sword for show at every meet, but I don't fight with it. It's too sharp.

the things they carried

interview and photographs by SPIKE JOHNSON



5



6



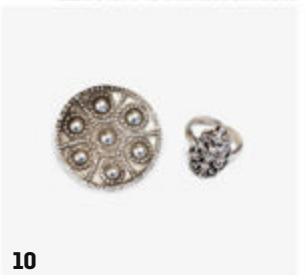
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8



9



10

THIS AUGUST, on the 750th anniversary of the Battle of Evesham, a few hundred people will assemble in the English countryside to restage the bloody fight that cost Simon de Montfort—the rebel earl of Leicester who established the first English parliament—his life. Bearing swords, they'll take the sides of the Second Barons' War: de Montfort's forces versus those of King Henry III. Directing this drama will be Kim Siddorn, the 73-year-old organizer of Regia Anglorum, a historical re-enactment group focusing on the lives of people who populated the British Isles between the eighth and 13th centuries.

Founded in 1986, Regia Anglorum—Latin for "Kingdoms of the English"—gathers monthly for what it calls "meets." Clad in period dress, members practice embroidery, play dice games, and cook meat over open fires. All are also invited to participate in each meet's centerpiece: a carefully orchestrated mock battle.

The goal is to keep fading British history alive. Siddorn, who retired from a motorcycle shop in the late 1980s to run Regia Anglorum, says his interests "wax with the sacking of Rome in 410 A.D. ... and wane with the Battle of Senlac Ridge, October 14, 1066." He often spends his days scouring websites and trade shows for historically accurate gear, some of which he keeps in his small Bristol home: longbows dangle above stairs, cannonballs function as paperweights, shields are propped against doors. (He has loaned some props to *Game of Thrones*.)

FOREIGN POLICY recently had tea with Siddorn at his house to learn how he suits up for battle.

5

Winter hat

This is made of sealskin. It's just used for warmth, but it's a little scratchy. I wear this for winter re-enactments or for times when I'm not wearing a helmet.

6

Viking coins

These are replica coins, but you couldn't tell the difference. The replicas are pewter, and the originals are made of silver. I have some original coins, but I don't play with them at meets; they're too valuable.

7

Turn shoes

These are authentic to anyone living in the Dark Ages. You make the shoes inside out, then turn them the right way—hence the name. I've worn these for 15 years, in battle and in parades. I've had to have them resoled three times.

8

Chain-mail shirt

This is an authentic Viking design. Every ring is produced separately: punched, then a wedge-shaped rivet is made, and that rivet is driven through the hole, against an anvil. I bought this from a third-party trader about four years ago for 450 quid.

9

Helmet

This was made for an exhibition at the National Geographic Society in 2011. I just use this helmet for a parade costume. I was given it about a year ago as a gift, when the exhibition closed.

10

Brooch and ring cover

I made these. The brooch, which is gold-plated silver, holds my shirt together at the neck, and the ring is to cover my wedding ring. Vikings didn't wear wedding rings.

by RAYMOND BIESINGER



"To me, the term 'energy superpower' is a little optimistic; that is, a reliance on oil alternately enhances and handcuffs a nation. With Russia today, I'm left to wonder how Putin and Co. are relating to their own massive, oily assets—particularly as their economy suffers under the weight of sagging energy prices and sanctions levied over the crisis in Ukraine.

Should Vladimir Putin support the rebels in eastern Ukraine too much, Russia will find itself overstretched: The country has larger concerns than fueling up the army and spending political capital on minor adventures. On the other hand, push too little, and Russians might wonder why their leader is a failure at both managing the economy and defending the rights of Russians abroad. Ukraine, I think, can look forward to a stable, awful stalemate in its east until oil prices recover. After that, all bets are off.

I care about this situation's facts, as far as they can be known. Yet I have no way to affect Putin's moment, nor it a way to affect me. I read such circumstances as if they were *Hamlet*, studying them in hopes of understanding how people make decisions in different situations. Here, Putin is looking over his shoulder at Russia's massive oil infrastructure, sanctions, and economic decline, and making up his mind about what to do in Ukraine—which he holds in one of his hands."

—THE ARTIST


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Is the Hermit Kingdom truly malevolent—or simply misunderstood?

In 2011, Korean-American journalist SUKI KIM spent six months undercover as a teacher at an elite, all-male Pyongyang school for science and technology—her fifth visit to North Korea—where she collected stories for her memoir, *Without You, There Is No Us*. Former New Mexico Gov. BILL RICHARDSON has visited the country eight times: first as a congressman in 1994, to discuss a nuclear arms deal, and most recently in 2013, as a private citizen with Google Chairman Eric Schmidt. Kim and Richardson recently connected to swap travel tales, debate North Korean diplomacy and language—and, of course, discuss *The Interview*.



SUKI KIM



BILL RICHARDSON

BILL RICHARDSON: In my negotiating with the North Koreans, they always were sending the following messages: One, they're a very proud, strong country. Nobody controls them. They want to be considered on par as a major power with the United States. Number two, It was very clear that they had a total devotion to their leaders, the structure of the party, the military—they were paramount in any of their discussions. They never made a decision on the spot. In negotiating with them, their idea of a concession was not a quid pro quo, like in Western countries. Their idea of a concession was they're not going to budge, but what they will budge on is they will give you enough time to come to their conclusion, eventually. Time for them is not of the essence. **SUKI KIM:** I was teaching the sons of the elite, who are 20-year-old young men, who are going to be the future leaders. And when you say the North Korean negotiators never, ever deter from their script, these boys didn't either. Yet, there was a disconnect. They always sing about killing Americans. I asked them, "When you sing those songs, where do I fit in? I'm South Korean and American." They were almost laughing. They can see the humor in it. I remember them awkwardly smiling and saying, "Oh, you're different from that, because you're our teacher." You were also talking about the absoluteness of power, which I totally relate to. Everything was number one: They are Number One Hospital, Number One District. Every student had a number. The hierarchy was so labeled with each existence; they're all soldiers. It is an incredibly vigilant way to live.

BR: For the North Koreans, I've found everything is very personal. I remember being there at a time when President [George W.] Bush called Kim Jong Il a tyrant in one of his memoirs. The North Koreans were very insulted. They saw that as personal. [Recently] they felt that *The Interview* was an attack on the deity, on their heart and soul. The North Korean government is rallying the people and saying, "See how the Americans have depicted our leader, with a lot of disrespect. This is why you have to continue listening to us and why we should fear the outside world." But I recall vividly being in North Korea with Eric Schmidt of Google, and we went in, and it was very obvious that only a very small percentage of North Koreans, the elite, had access to the Internet. They weren't about to expand it, because they knew if they did that, it would possibly fuel an Arab Spring reaction. **SK:** Absolutely. My students didn't know the existence of the Internet. I taught at a school for science and technology computer majors. They had no idea what the Internet was. It's not possible to open that world up to the Internet, because then that would break the myth of the great leader.

RICHARDSON: ALBERTO E. RODRIGUEZ/GETTY IMAGES; KIM: ED KASHI

BR: In the past, the North Koreans didn't care about any international organization or the criticism. But in the last year they have become sensitive, in reaction to the United Nations' efforts to refer them to the International Criminal Court on human rights violations. They were hit very hard by this U.N. report [that accused North Korea of crimes against humanity and recommended prosecution of the country's leaders] and are starting to react, possibly in a positive way. I foresee them allowing some access by some U.N. inspectors. They don't want their leadership referred there for possible war crimes. **SK:** The fact that North Korea is seriously nervous about all of that—ultimately that is one good thing, no? Because nothing will make them do anything. **BR:** I do believe they're nervous, and I believe they're trying to weigh their response. Another issue is that I think North Korea gets very bad publicity. **SK:** Some of the reason for that—and I think actually one of the shocking things when I'm in North Korea, because I grew up in South Korea and I'm fluent in Korean—is how violent even the language is, and crude and crass. All curse words. Back to back to back. When they called the [South] Korean president a prostitute, that's not really an accident because the rest of their language is like that. It's almost like linguistic violence. Because of that, violence pervades their entire culture in some way. Bad publicity also gives them a one-track image, as if they're not human beings and there are no human emotions within that country. I would think the only thing I can do is to describe that world so that we have some empathy for the country beyond looking at it as this one-dimensional cartoon, which is how it's coming across now. The rest of the world really relates to Americans as human beings, as real people, because of all the publicity we've generated, whether it's through movies or whatever. But I don't think we feel that way at all with North Korea. "Who is Kim Jong?" We have no idea. Now we have a portrait from the movie *The Interview*. But we have no idea about that world.

BR: In terms of American policy, I've always felt that it's better to have a dialogue with your enemies than not. That doesn't mean when you talk you're giving up anything, but there's so much mutual mistrust. Admittedly, North Korea's very difficult. But I do believe there's potential grounds of compromise because they need food, they need humanitarian assistance. They want technology; they want investments; they want sanctions lifted. Their people are starving. Their agriculture is totally unmechanized. **SK:** So we should just keep engaging? **BR:** That's my view. I think you have to talk to them and bring South Korea in. I think reunification of the peninsula is a ways off, but maybe they should start talking. Nobody said the two Germanys could come together, but they did. **SK:** I did really love my students so much, and I felt the degree under which they were controlled, and their humanity was completely suppressed beyond belief. I actually did not feel any hope. You say, yes, we have to keep engaging, but we engage at what expense? Because I just didn't see any light at the end of the tunnel, and these were the elite. I don't know how we engage with a regime that does that to its people, because they don't behave any other way. ■

"THE REST OF THE WORLD REALLY RELATES TO AMERICANS AS HUMAN BEINGS, AS REAL PEOPLE .... BUT I DON'T THINK WE FEEL THAT WAY AT ALL WITH NORTH KOREA."

This conversation has been condensed for publication. Go to FOREIGNPOLICY.com for the extended version.

by JAKE SCOBEY-THAL

Asia's Bride Market

On its website, J&N Viet-Bride Match-making Agencies promises "single, divorced or widow[ed]" men that it will help them "find their right/suitable lifetime wife" with "the shortest time & hassle." Alongside pictures of smiling couples, the Singapore-based business pitches itself as a one-stop shop for prospective grooms looking for love outside the small island nation—specifically, a few hundred miles away in Vietnam.

J&N, which, among other services, arranges travel itineraries, first dates, and language classes so that new couples can communicate, is part of a growing trend: Across East Asia, a booming demand for brides is pushing (and sometimes forcing) women from poor countries—many of them in Southeast Asia—to wealthier ones. Altogether, more than half a million women have migrated to East Asia to wed since the early 2000s. In South Korea, as just one example, the percentage of men marrying noncitizens jumped from 1.6 percent in 1993 to 8 percent in 2013.

While international marriages have become a thriving industry in Asia, a dark underbelly also exists: Human trafficking plays a role in this migration, which has led some countries to enact restrictions on marriage brokering. Yet some women travel on their own terms, choosing to wed across borders for a more stable life, for long-term citizenship, or, yes, for love.

1 ALL THE SINGLE LADIES
The demand for foreign brides is particularly prevalent across affluent parts of East Asia: South Korea, Singapore, Japan, and Taiwan, for instance. As economists Daiji Kawaguchi and Soohyung Lee outlined in their 2012 paper, "Brides for Sale: Cross-Border Marriages and Female Immigration," men look abroad because a growing number of women in their home countries are delaying marriage or even opting out altogether. As women become more educated and financially independent, many are electing to forgo what remain highly patriarchal partnerships. According to Kawaguchi and Lee, a college-educated woman in developed East Asia is 50 to 200 percent more likely to remain single than a less-educated counterpart.

2 NO COUNTRY FOR ELIGIBLE MEN
China is one of the nerve centers of the foreign-bride market because of its distended gender gap. The country reported that 116 boys were born for every 100 girls in 2014. This disparity is largely a consequence of a decades-old fertility policy: Most Chinese families are restricted to having only one child, and in a culture where men are prized, the availability of sex-selecting technologies—namely abortion—has fueled one of the world's most unbalanced birth ratios. In 2020, there will be an estimated 30 million more Chinese men of marrying age than women in the same group.

3 MATCHMAKER, MATCHMAKER
A network of professional marriage brokers keeps the bride market buzzing. In some cases, these intermediaries organize male and female recruits—often attracted through "mail-order" websites—to meet collectively in prospective brides' home countries. The young singles go on a series of group dates, eventually pair off, and, within a few days, apply for marriage licenses. In other cases, the process is less structured, with family, friends, or informal matchmakers coordinating connections abroad.



Illustration by JAMESON SIMPSON



LOVE DOES COST A THING
The costs of a foreign match, which can include broker payments, a dowry, and legal fees, typically run in the tens of thousands of dollars. J&N's cheapest package, for example, runs a prospective groom around $4,500.

BOUGHT AND SOLD
The marriage trade isn't always transparent. Some women are entrapped under false pretenses, coerced, or even sold into marriage against their will by family members, according to human rights groups. In January, Cambodian authorities arrested three suspects for allegedly trafficking women into China to wed. The arrests came months after the two countries announced plans to draft a memorandum of understanding to curb the cross-border trafficking of brides.

GRAY AREAS
Often the circumstances of foreign brides don't fit neatly into either legitimate matchmaking or forced marriage. For example, many women agree to marry voluntarily in the hopes of achieving upward socioeconomic mobility, but they may be given false information about the locations or incomes of their future spouses. Concerned about these more implicit forms of exploitation, a number of countries have tried to regulate bride migration. In South Korea, international-marriage brokers must register with the state; in Vietnam, commercial marriage agencies are outlawed altogether. (Weak rule of law, however, has allowed the practice to continue, and businesses like J&N regularly seek Vietnamese brides.)

MARRIAGE IS HARD WORK
The divorce rate among couples that meet through the bride market is high. In South Korea, four in 10 mixed-race marriages break down in the first five years, according to a survey by the Seoul-based Korean Women's Development Institute. In response, last year the country placed new restrictions on such marriages: A prospective foreign bride must be fluent in at least one language her groom speaks, and Koreans are now limited to a single marriage-visa request every five years. In fact, South Korea has budgeted more than $100 million annually to fund counseling, interpreting services, and language classes for marriage migrants, among other foreigners, and their families. Other wealthy countries are also investing public resources in helping women adjust to their new communities. Local governments in Taiwan, for example, have organized cultural training programs for foreign brides.



ARTIFICIAL SKIN, DESIGNED FOR PROSTHESES.

Reach Out and Touch Me

Despite great leaps in the past 15 years, prosthetic limbs still can't experience the full range of human touch, like when something is burning hot, freezing cold, or about to slip from grasp. In a December article in the journal *Nature Communications*, a group of American and South Korean researchers from five institutions announced that they had come one step closer to full sensation with a new artificial skin, designed for prostheses, that can sense moisture, temperature, and pressure. It's thin, and thanks to a special configuration of silicon and gold sensors, it's extremely flexible and can stretch without tearing. To make it even more realistic, it's fitted with a heating system, making it warm to the touch.

Before the skin becomes patient-ready, which is still years away, scientists need to develop advanced technology that could trick the brain into thinking prosthetic devices are the body's own.

A Drone Called WANDA

THE U.S. MILITARY IS ADDING to its weapons arsenal; her name is WANDA. This friendly moniker does little to signify its importance in the future of warfare, but the Navy is betting that the Wrasse-inspired Agile Near-shore Deformable-fin Automaton and its fellow autonomous underwater vehicles (AUVs) will transform sea surveillance—and at a fraction of the cost and risk of current manned systems, like the submarine.

The Navy already uses torpedo-shaped, long-range AUVs to explore the deep sea and report to submariners on water conditions. But at 100-plus pounds and approximately 6 feet in length, these gliders are too cumbersome to navigate through dense obstacles or complete complex maneuvers. Highly agile, slow-moving AUVs—for deployment, say, around sensitive coastal installations or in shallow harbors—are a much more challenging endeavor.

Enter WANDA, whose build was modeled on the bird wrasse, a pointed, medium-sized fish. By studying this creature's pectoral fins and its swimming patterns through the cluttered coral habitats of its native Indian and Pacific oceans, the U.S. Naval Research Laboratory developed a drone prototype nimble enough to swim in shallow waters. WANDA, which is designed to travel at a speed of 2 knots, can turn in place, move laterally, and hold its position in light currents.

The prototype, which looks a little like a clear plastic football with four fins, is designed to carry a variety of interchangeable sensors that can be installed and replaced in the robot's body, depending on its mission. WANDA doesn't have a propeller; rather, its maneuverability comes from its side-mounted fins, which continuously respond to the environment.

This is not the Defense Department's first turn in biomimicry. In fact, it is funding research on robotic swimmers modeled on tuna and jellyfish, and it is testing another underwater drone—but this one resembles a shark, dorsal fin and all.

Developing AUVs like these takes years. Navy researchers have been studying the wrasse for over a decade, and the WANDA prototype is still undergoing tests. This year, though, Pentagon officials indicated that the 2016 budget would include "significant" investments in underwater robotics. If all goes as planned, WANDA will one day patrol murky, obstacle-filled waters to inspect ship hulls or hunt for the presence of trace chemicals. It would join a growing global AUV fleet, from some 600 in 2014 to an estimated 825 by 2018, according to the research firm Douglas-Westwood. That is to say, the drone called WANDA will likely have a sequel.



Inspired by the pectoral fins of reef fish, researchers at the U.S. Naval Research Laboratory developed the autonomous underwater vehicle known as WANDA.

COURTESY OF NATURE COMMUNICATIONS



COURTESY OF U.S. NAVY

Build Here Now

For years architects have been able to develop and explore their designs with digital models. But what if people could actually see a design, in 3-D, at the physical building site? An augmented-reality system developed by researchers at Germany's Fraunhofer Institute for Applied Information Technology (FIT) promises to let people do just this. Users of Auto AR, as FIT's system is called, can drive up to a construction site, put on a GPS-equipped virtual-reality headset, and explore the three-dimensional architectural rendering that appears superimposed on the landscape before them. While Auto AR can be installed in any car, the system requires a headset that will display plans exported from the popular design software Autodesk Revit. FIT claims that Auto AR's 3-D models are accurate to the centimeter.

The system, which was demonstrated at a January architecture and construction conference in Munich, could certainly help architects and their clients, who could scrutinize plans on a real-world scale, as well as average citizens, who could better evaluate the effects of construction on their communities.

Orbital Decay

MILLIONS OF PIECES OF TRASH are in constant orbit around the Earth: Dead satellites, old rocket parts, and tiny bits of paint are all spinning through the void at thousands of miles per hour, threatening active satellites and space missions. The International Space Station had to dodge debris five times in 2014 alone. And in 2009, a defunct Russian satellite and a privately owned American satellite collided, shattering both and creating even more trash in the process. The problem will only worsen as countries and corporations race to put more satellites into orbit—around 115 per year through 2023, according to the space and communications consulting firm Euroconsult.

In response, NASA's Jet Propulsion Laboratory is developing technology that can finally collect all this space junk. By exploiting the same property that binds the tiny hairs on gecko feet to slick surfaces, gripping pads will use mushroom-shaped bristles to grasp pieces of debris, even at the extreme speeds and temperatures of space. Tests haven't yet been conducted in orbit, but in an August 2014 trial (the results of which were publicized in December), the agency's gripper managed to wrangle a human volunteer floating weightlessly through the cockpit of an airplane in parabolic flight.

300,000,000

THAT'S HOW MANY PEOPLE MAY DIE PREMATURELY FROM DRUG-RESISTANT INFECTIONS BETWEEN 2015 AND 2050. BUT IT DOESN'T HAVE TO BE THIS WAY: RESEARCHERS FROM DUKE UNIVERSITY AND THE UNIVERSITY OF CONNECTICUT ARE HOPING THEIR NEW SOFTWARE, OSPREY, WILL PREDICT HOW BACTERIA MUTATES IN RESPONSE TO NEW DRUGS.

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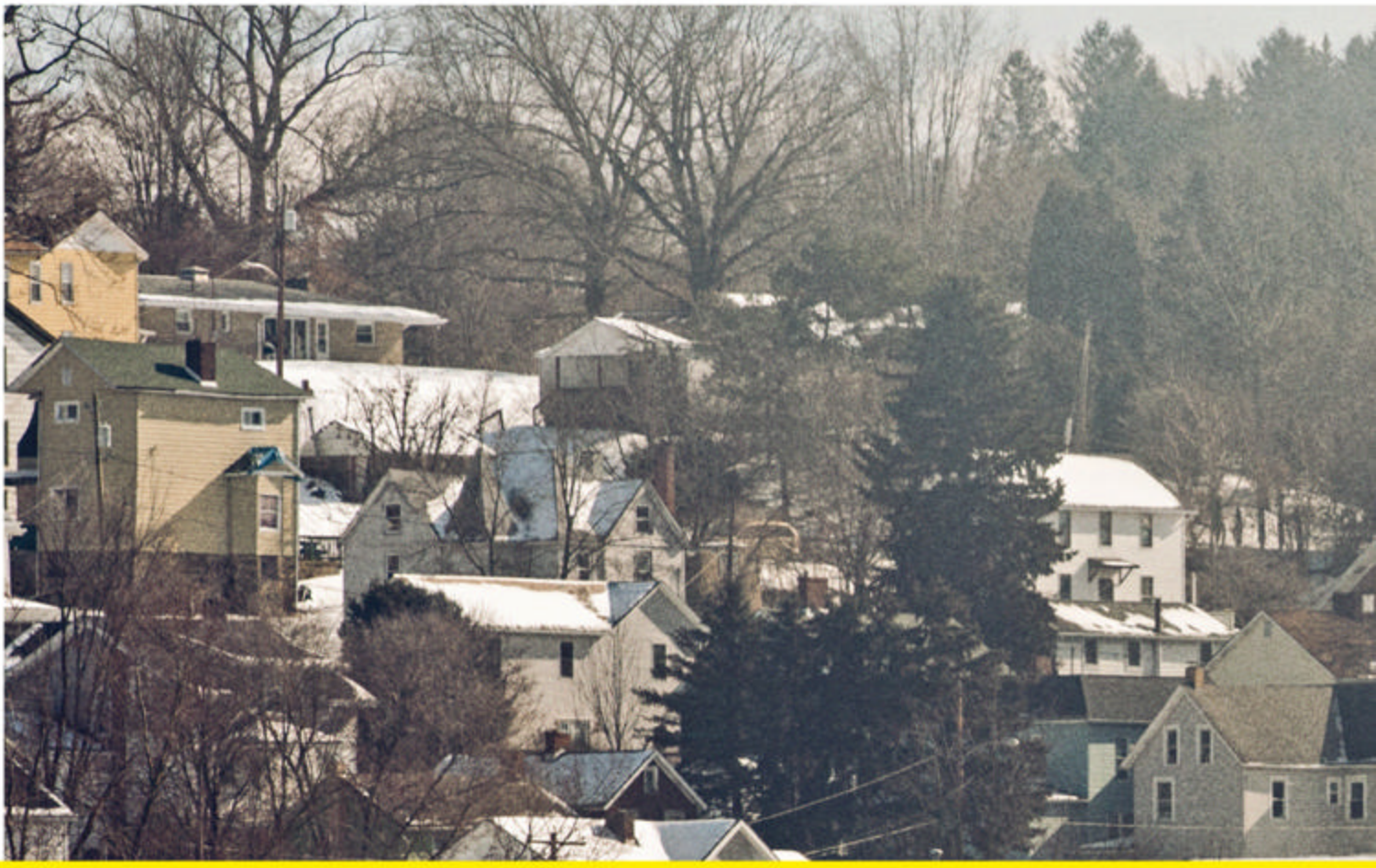
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features

AFTER OBSERVING the first nuclear bomb explosion 70 years ago this summer, a U.S. brigadier general described the Trinity blast as "magnificent, beautiful, stupendous, and terrifying." The event upended history, of course, and humanity has shouldered the consequences ever since—the policies, innovations, and threats of the nuclear era. Today, atomic inscrutabilities and controversies endure: Pieces of the science are yet to be mastered while, in some cases, governments have willfully ignored proven dangers. In FP's nuclear issue, John Mecklin shows that the world's nuclear powers are embarking on costly weapons upgrades, challenging the treaties designed to make the world safer; Sarah Laskow explores the unresolved science and politics of low-dose radiation exposure; and Scott C. Johnson reports from Apollo, Pennsylvania, where, in the 1960s, spies may (or may not) have stolen uranium to fuel Israel's nuclear program. One thing is certain: When it comes to nukes, what we don't know can definitely still hurt us. — *The Editors*



Photograph by JEREMY BLAKESLEE



In the 1960s, hundreds of pounds of uranium went missing in Pennsylvania. Is it buried in the ground,





poisoning locals—or did Israel steal it to build the bomb?

What Lies Beneath

BY SCOTT C. JOHNSON

Photographs by CHRISTOPHER LEAMAN



AS A KID IN THE 1960S, Jeff Held thought that having a nuclear company in his backyard made life more exciting in Apollo, Pennsylvania. About 2,400 people lived alongside the Nuclear Materials and Equipment Corporation (NUMEC), the town's main employer. Held's neighborhood subsisted on atomic lore: Just 33 miles down the road in Pittsburgh, the Westinghouse Corporation had helped construct the world's first nuclear submarine, and in Apollo, NUMEC consequently manufactured the requisite nuclear fuel, a source of stirring pride minted by the Cold War.

To Held, the plant, its lights flickering over the western edge of town on the banks of the Kiskiminetas River, was "kind of neat." When one of the town's radiation monitors went off, children would dash through neighbors' backyards to reach the facility—it was housed inside a refurbished steel mill with dirt floors, big windows, and dozens of smokestacks—to see what had happened.

As Held grew older, the plant that inspired his boyish thrill evolved into something more puzzling, and more sinister. NUMEC closed its doors in 1983, and in the mid-1990s, the federal government swooped in and declared several city blocks contaminated. Various agencies rolled in with bulldozers, razed the plant, and carted off the radioactive pieces, barrel by barrel, for disposal. Ever since, Apollo's residents have been grappling with fears that NUMEC poisoned their town.

One bitterly cold day this January, Held—now 53 and Apollo's mayor—drove me north on State Route 66, which cuts along one side of the old NUMEC site. A green chain-link fence outlines the desolate acreage where the factory once stood. Held, a stout man with a graying beard, gestured up a hill toward several decaying Victorian houses. The residents, he said, have suffered from various cancers: lung, thyroid, prostate, brain. They have argued that years of radiation soaking into their soil, air, water, clothes, and homes had led to their afflictions. To date, owners of the NUMEC property have shelled out tens of millions of dollars in compensation to locals who've filed suit.

Apollo's woes didn't end with those payouts, however. Held told me that events shifted, alarmingly, one day in September 2011, two years before he was elected mayor. That's when he saw several white SUVs, with blue U.S. Homeland Security decals emblazoned on their sides, stationed on the road just five miles north, in Parks Township. As he drove up the road, Held said, men with high-caliber military assault rifles milled around. It looked like a Hollywood blockbuster about a terrorist attack.

In Parks, a second NUMEC facility had produced plutonium starting in 1960, but it also had served another purpose: nuclear disposal. From 1961 to 1970, the corporation dug at least 10 shallow trenches, spread across about 44 acres, into which it dumped radioactive waste; some locals speculate that other companies around the country shipped their waste to Parks to be buried too. Although the U.S. Army Corps of Engineers (USACE) had been put in charge of cleaning up the site in 2002, under congressional authorization, the process didn't begin until almost a decade later—right before Held encountered the madness on the road.

In October 2011, the USACE announced that Cabrera Services, a Connecticut-based contractor hired to clean up Parks, was suspended for mishandling materials during excavation activities, which the company acknowledged. The following year, the USACE uncovered an unexpected variety of "complex" radioactive contaminants in the ground, but it didn't say all of what it had found or how much of it. In a December 2014 report, the USACE noted that among the contaminants it expects to find are several "radionuclides of concern," including americium-241, radium-228, uranium-235, and various types of plutonium, which, under the right conditions, could be used as ingredients for a dirty bomb. It seems the material buried at Parks is more dangerous than anyone had previously imagined.

The USACE immediately ceased the excavation and established a 24-hour patrolled security perimeter that's still in effect today. Bidding for a new cleanup contractor starts this summer, and the work, now forecast to begin in 2017, is expected to cost roughly half a billion dollars—10 times the original estimate in 2002.

The nuclear mess in Parks could hold clues to yet another mystery in this Pennsylvania community, one that has bedeviled nuclear analysts for decades. Beginning in the early 1960s, investigators from the Atomic Energy Commission (AEC), the agency that regulated U.S. nuclear facilities at the time, began to question how large amounts of highly enriched, weapons-grade uranium had gone missing from NUMEC. Any nuclear site had a certain amount of loss, from seepage into walls and floors, for instance. In fact, between 1952 and 1968, lax standards at

APOLLO MAYOR JEFF HELD SAYS MANY PEOPLE WHO LIVED NEAR NUMEC LATER DIED OF CANCER. THE SCRAP PILE BEHIND HIM CONTAINS PIECES OF THE OLD FACILITY.



20 of the country's commercial nuclear sites resulted in an apparent loss of 995 kilograms (2,194 pounds) of uranium-235. But investigators found that at NUMEC, hundreds of pounds went missing, more than at any other plant.

NUMEC's founder, Zalman Shapiro, an accomplished American chemist, addressed the concern in 1978, telling Arizona Congressman Morris Udall that the uranium simply escaped through the facility's air ducts, cement, and wastewater. Others, such as the late Glenn Seaborg, the AEC's chairman in the 1960s—who had previously helped discover plutonium and made key contributions to the Manhattan Project—have suggested that the sloppy accounting and government regulations of the mid-20th century meant that keeping track of losses in America's newborn nuclear industry was well near impossible. Today, some people in Apollo think that at least a portion of the uranium might be buried in Parks, contaminating the earth and, ultimately, human beings.

But a number of nuclear experts and intelligence officials propose another theory straight out of an espionage thriller: that the uranium was diverted—stolen by spies working for the Mossad, Israel's intelligence agency. In the 1960s, to secure nuclear technology and materials, Israel mounted covert operations around the world, including at least one alleged open-ocean transfer of hundreds of pounds of uranium. Some experts have also raised questions about Shapiro himself. He had contacts deep within Israel's defense and intelligence establishments when he ran NUMEC; several of them even turned up at his facility over time and concealed their professional identities while there.

Fifty years after investigations began—they have involved, at various times, the AEC and its successors, Congress, the FBI, the CIA, and other government agencies—NUMEC remains one of the most confounding puzzles of the nuclear era. "It is one of the most interesting and important Cold War mysteries out there," said Steven Aftergood, who directs the Project on Government Secrecy at the Federation of American Scientists. "Mainly as a story of clandestine nuclear proliferation, intelligence, security bungling, and the limits of intelligence." The questions about Shapiro, meanwhile, linger: Is he a great American innovator, a traitor, or both? (Shapiro, now 94, has never been charged with a crime or convicted of one, and he has steadfastly proclaimed his innocence.)

Answers could emerge, once and for all, during the upcoming cleanup in Parks. Residents of this corner of Armstrong County, Pennsylvania, could finally be told that the missing uranium has been beneath and around them all along—that large amounts of dangerous and volatile radioactive waste have been festering in the soil for more than half a century. Or they could learn that the material was indeed at the center of international intrigue. Either way, the small town of Apollo may long for boring anonymity.

IN THE HEADY, POSTWAR ERA of industrial expansion, when the United States was building its nuclear arsenal and touting the benefits of a commercial energy industry, Shapiro established NUMEC in 1957. The facility's operation involved the latest in advanced nuclear technology. From a containment chamber known as a "hot cell," workers, clad in bodysuits and shoe covers, manipulated robotic arms that handled highly radioactive material in a separate room.

By the early 1960s, NUMEC was acquiring U.S. government contracts to power the country's growing fleet of nuclear submarines and aircraft carriers. The company received uranium—enriched, in some cases, to upwards of 90 percent, or weapons-grade quality—from government-run plants in Oak Ridge, Tennessee, and Portsmouth, Ohio, and fabricated it into fuel to feed naval reactors. NUMEC, with Washington's approval, also did business with at least nine foreign governments, including France, Israel, and Japan. It even branched into medical technology: In the late 1960s, NUMEC won a bid to devise the first American-made, nuclear-powered pacemaker. (The device was implanted into a live patient in 1973, and 138 more were subsequently used



TODAY, THE EMPTY LAND WHERE NUMEC ONCE STOOD IS SURROUNDED BY A CHAIN-LINK FENCE; NO FUTURE CONSTRUCTION IS ALLOWED IN THE AREA.

before the technology was discontinued.)

Shapiro, who invented the nuclear pacemaker himself, was the brains behind NUMEC's projects. Born in Ohio in 1920, he had grown up in an Orthodox Jewish home in New Jersey, the son of a Zionist rabbi who had immigrated to the United States from Lithuania. Valedictorian of his high school class, Shapiro attended Johns Hopkins University, where he earned a Ph.D. in chemistry. Afterward, while on a contract with Westinghouse, he helped build America's first nuclear-powered submarine, the *USS Nautilus*. He also developed fuel for America's first commercial nuclear power plant, established at Shippingport, in western Pennsylvania. In 1953, when Shapiro was just 33, Westinghouse honored him with its highest achievement award, the Order of Merit.

Shapiro cut a striking figure in tiny, working-class Apollo. Each day he arrived in an electric-blue sedan from Pittsburgh, where he lived with his wife, Evelyn, and their growing family. He wore elegant suits that reflected the afternoon sun. According to friends, in addition to throwing himself into his work, Shapiro dedicated significant time and energy to the cause of Israeli statehood. He was involved with the Zionist Organization of America, a group devoted to strengthening U.S.-Israel ties. At one point, he became president of the Pittsburgh chapter. He supported the American Technion Society, which in turn raised funds for the elite Technion-Israel Institute of Technology. In 1966, after NUMEC had become a successful company, Shapiro formed a new business venture with the Israeli government, called Isotopes and Radiation Enterprises Limited (ISORAD), to build technology that could irradiate perishable fruits and vegetables and extend their shelf life.

But Israel's national ambitions went well beyond top-notch apples and lettuce. Behind closed doors in the 1960s, world leaders, such as French President Charles de Gaulle and U.S. President John F. Kennedy, had begun acknowledging Israel's perceived intentions to develop the bomb.

(Some experts even believe that by the time of its 1967 war with Egypt, Israel already had at least one nuclear weapon.) In one daring 1968 operation, Mossad agents allegedly bought roughly 200 tons of yellowcake, a pre-enriched form of uranium ore, from a Belgian company. Operation Plumbat occurred when a cargo vessel, the Scheersberg, left Antwerp, heading for Genoa, Italy, with the uranium on board. The ship never arrived at the Italian port, instead docking in Turkey, but without the material. Intelligence experts agree that Mossad agents conducted a dangerous ship-to-ship transfer in the Mediterranean.

Israel never admitted to the act, which was investigated by the European Atomic Energy Community and the CIA. But assuming the uranium did arrive in Israel, it likely would have gone to Dimona, a nuclear reactor purchased from France in the late 1950s and built in the Negev Desert. In the next decade, according to Avner Cohen, an expert on Israel's nuclear history and a professor at the Middlebury Institute of International Studies at Monterey, Israel said for a brief time that Dimona was being used for peaceful purposes, but then switched its policy to one of opacity. (To date, Israel has never admitted to possessing a nuclear arsenal; it is widely believed that the country has at least 75, and perhaps as many as 400, nuclear warheads.)

It was the combination of Israel's nuclear mission and Shapiro's established professional dealings with its government that aroused suspicions when, mysteriously, uranium started disappearing from NUMEC.

AS COLD WAR TENSIONS ramped up in the 1950s, America's nuclear arsenal was expanding and so too was NUMEC's business—so quickly that the U.S. regulatory environment simply failed to keep pace. Not only were the quality controls for companies like NUMEC poorly enforced or nonexistent, but few protections were in place. The AEC, which oversaw shipments of uranium and plutonium to and from private plants, did not require security clearances for all personnel handling nuclear material, according to former AEC chairman Seaborg, who documented the loose regulatory environment in his 1993 book, *The Atomic Energy Commission Under Nixon: Adjusting to Troubled Times*. There were international consequences as well: The AEC, he wrote, also lacked a robust system to independently verify how much material was getting shipped overseas. Nevertheless, NUMEC managed to catch the AEC's attention, and not in a good way. By the early 1960s, the commission had begun eyeing the Apollo facility because of the plant's poor record-keeping.

According to declassified documents, even though the AEC had frequently requested that Shapiro provide data on NUMEC's stocks of highly enriched uranium, the corporation had repeatedly failed to do so. By 1966, Shapiro's company had already paid $1.1 million in fines for uranium losses that NUMEC had willingly acknowledged. The previous year, the AEC had conducted an inventory of highly enriched uranium stocks at NUMEC and found that roughly 200 pounds could not be accounted for. (To put this into perspective, by today's standards it only takes 35 pounds of uranium-235 to make a nuclear bomb that works.)

To be sure, NUMEC wasn't fully to blame. In the AEC's official summary of a February 1966 briefing with its commissioners, the AEC's assistant general manager, Howard Brown, said there were two powerful safeguards the nuclear industry could rely on to maintain the integrity of its stocks: financial penalties for missing nuclear materials and, when it came to commercial plant operators, a "presumption of honesty." Without the latter, Brown said, the accountability system "did not present itself in the most credible light."

Some AEC officials wanted to pursue the Apollo mystery further, particularly the Israel connection, but more senior officials prevailed, namely Seaborg. He impressed upon his fellow commissioners the importance of maintaining the NUMEC losses as an in-house matter—in other words, keeping FBI investigators away. While a diversion of uranium to Israel was possible, it was unlikely, Seaborg wrote in a letter to the chairman of the Joint Committee on Atomic Energy. Thus, when the AEC did investigate the matter in 1966, the effort was anemic at best. AEC officials visited NUMEC, for example, but they did not take any formal statements or pursue possible leads, according to recently declassified documents analyzed by Victor Gilinsky, a physicist and former commissioner at the Nuclear Regulatory Commission (NRC), a successor to the AEC. The FBI briefly considered Shapiro's involvement with ISORAD, but the inquiries led nowhere. The Justice Department declined to investigate. Little by little, the documents show, the AEC's lobbying efforts succeeded in stymieing questions about what was happening at NUMEC.

Gilinsky and other longtime observers of the NUMEC affair think the AEC may have deliberately stifled the investigation because it didn't want a controversy to derail its broader ambitions of developing a robust, nationwide network of nuclear businesses. "The AEC's interest in damp-

As Cold War tensions ramped up, America's nuclear arsenal was expanding and so too was NUMEC's business—so quickly that the U.S. regulatory environment simply failed to keep pace.

ing it down initially was basically to protect the industry," Gilinsky said. "They had all this future lined up," he added, "and they didn't want a public impression that this would lead to dangers of losing material, so they were just protecting their enterprise mainly."

In April 1968, however, CIA Director Richard Helms requested that the FBI once again scrutinize NUMEC and Shapiro. Unbeknownst to the public at the time, Helms had learned something that would prompt him to approach President Lyndon B. Johnson. The exact content of this exchange remains classified, but in the months preceding the briefing, CIA operatives on the ground in Israel had covertly taken and tested environmental samples around the Dimona reactor. The results were disturbing. They showed the presence of a type of very rare uranium used in naval fuels that had been enriched to 97.7 percent. According to Roger Mattson, a physicist and former AEC and NRC staffer, it was the purest stuff around, and there was only one place in the world that was producing it in the 1960s—an enrichment plant in Portsmouth, Ohio, that had one customer: NUMEC. The Dimona samples, in other words, seemed to indicate a direct through-line from Portsmouth to Israel, via Apollo. Declassified documents show that when Helms alerted Johnson to the CIA's intelligence that April, the president reportedly responded: "Don't tell anybody else. Don't even tell [Secretary of State] Dean Rusk or [Secretary of Defense] Robert McNamara."

The FBI soon placed Shapiro under surveillance at the request of Attorney General Ramsey Clark, who wanted to know whether the Pennsylvania scientist was "acting as an agent for the Israeli Government," according to a 1968 FBI document. Just two months later, the bureau tapped Shapiro's phones.

No sooner had the surveillance begun than suspicious activity at NUMEC started to surface. In September 1968, four Israelis visited NUMEC after Shapiro requested facility access from the AEC on their behalf. The Israelis claimed to be scientists; in NUMEC's request, one was listed as a "chemist," while two others said they were from the "Department of Electronics." (The fourth man on the team was a scientific counselor, an official from the Israeli Embassy in Washington.) They claimed to be visiting NUMEC to obtain plutonium-238 for non-nuclear projects.

In reality, the "chemist" was none other than Rafi Eitan, one of Israel's top spies. A short, gregarious man with a passion for sculpture and exotic fish, Eitan had been involved in some of his country's most high-risk espionage for decades. In 1960, he led the secret Mossad operation to kidnap Nazi war criminal Adolf Eichmann from Argentina and return him to Israel to stand trial for war crimes. (Eitan would later be fingered as the handler for Jonathan Pollard, an American civilian analyst for the Navy who spied for Israel for about a year and a half before he was caught in 1985.) Two of the other men visiting NUMEC, Avraham Bendor (who later went by the surname Shalom) and Ephraim Biegun, also had covert connections. Bendor was an agent for Shin Bet, Israel's domestic intelligence service, while Biegun headed up the Mossad's technical division. A visit by one of the men alone would have raised questions; the presence of all four together was cause for immediate concern.

Peter Stockton, a former senior investigator for the House Energy and Commerce Committee's Oversight and Investigations Subcommittee who spent decades prying into NUMEC, said he brought the incident up with Eitan, in the late 1980s, after tracking him down in East Germany through a friend. When the two met, Eitan regaled Stockton with "a blow-by-blow account" of the Eichmann operation. Stockton was captivated by the Israeli's flair for storytelling. But when Stockton asked about NUMEC, Eitan grew quiet, before saying, "I've never been to NUMEC. I don't know what you're talking about." Stockton kept pushing. "I said, 'That's bullshit; you know, we have your signature [on the AEC documents].' And then he said, 'Well, OK, I was there … but I was getting batteries for listening devices.'" (It wasn't the first time batteries had come up in connection to NUMEC and Israel: A letter from the AEC to the FBI, describing a 1969 interview with Shapiro, says NUMEC's founder "noted that a number of Israeli national officials had visited his facility under authorization of the AEC for the purpose of discussing nuclear activities, particularly power sources and irradiation.")

Stockton said Eitan laughed his way through the questioning. "He denied that he ripped off the uranium, but he just didn't sound very convincing to me." Stockton added: "He went from zero knowledge of the thing and no role to play, and then all of a sudden he admits he had been there. It was kind of bullshit the whole way."

Other skeptics scoff at Eitan's account as well. "What did Rafi Eitan know about batteries? Not a damn thing," said Mattson. "Why [would you send] three guys of that caliber with no technical background … to talk to Shapiro about plutonium-powered batteries? Give me [a] break. It's absurd."

Mattson added that stealing uranium out from under the noses of the U.S. government would have been precisely the kind of high-stakes covert operation at which these particular men excelled.

AROUND THE TIME Eitan showed up in Apollo, according to Stockton, Gilinsky, and others, some CIA officials had grown very insistent about the diversion theory. John Hadden, a former station chief in Tel Aviv, would even suggest that NUMEC was an Israeli operation "from the beginning," a detail reported in *Dangerous Liaison*, a 1991 book about the U.S.-Israel relationship. (Hadden died in 2013.) However, the AEC's efforts to quash investigations had largely succeeded, and no conclusive evidence of wrongdoing had come to light. Even as a few strident individuals tried to push the case forward, from the late 1960s to the mid-1970s, the NUMEC controversy lost momentum.

It wasn't until February 1976, in fact, when the newly created NRC was reviewing its licensing processes for private nuclear-fuel companies, that Apollo reappeared on Washington's radar. James Conran, an NRC engineer investigating safeguards against theft at U.S. nuclear facilities, urged the commission to look more closely at NUMEC, insisting that he



THE ARMY CORPS OF ENGINEERS' CLEANUP IN PARKS TOWNSHIP IS CURRENTLY IDLE. IT IS EXPECTED TO RESTART IN 2017 AND COST ABOUT HALF A BILLION DOLLARS.

couldn't issue his complete findings until it did so. So the NRC requested a confidential CIA briefing.

Gilinsky, then an NRC commissioner, remembers the meeting well. About 15 men sat in a bland conference room at the commission's headquarters in Washington and questioned Carl Duckett, the CIA's deputy director for science and technology. NRC Chairman William Anders asked Duckett point-blank whether there was anything to the rumors about NUMEC's missing materials. Whatever the group was expecting, it almost certainly wasn't what Duckett said next: that the CIA believed Israel did have the uranium from Apollo and was using it to make bombs. "The room just went sort of quiet," Gilinsky said. "Some of them were inspectors and focused on reactors and stuff, so I don't know that they fully grasped the significance of it, though some did." (Duckett died in 1992.)

More revelations followed. In July 1977, evidence suggests that Ted Shackley, then CIA associate deputy director for covert operations, briefed senior energy officials about the environmental samples from Dimona. For many, this was the key piece of missing evidence against Shapiro and NUMEC. Hadden, of the CIA, told the BBC in a 1978 interview, after news about the samples broke, "Just imagine to yourself how much easier it would be to remove a pound or two of this or that [inert material] at any one time … as opposed to removing, all at one blow, 150 pounds of [a] shouting and kicking Eichmann. You see, [the Israelis] are pretty good at removing things." (Stockton said he met Hadden in the late 1970s and early 1980s in safe houses in Washington's Georgetown neighborhood. The CIA official would pull out a 2.5-foot makeshift scroll of paper that contained his case against NUMEC. "This was before computers, and the thing was long and pasted together, and that was his evidence," Stockton said. "We'd sit there in the safe house, and he'd read me portions of it.")

The White House was informed of all the information gathered on NUMEC to date. In April 1976, Attorney General Edward

Levi wrote a memo to President Gerald Ford in which he said he thought NUMEC should be investigated further. Levi also laid out a series of federal crimes that could be applied to anyone, including people in government, who may have had a hand in covering up the alleged diversion. He wrote that if there were even a remote possibility that federal officials "may have participated in or concealed an offense," it was necessary to conduct an investigation. The investigation never came.

In March 1980, according to a declassified document, FBI agents interviewed a former NUMEC employee who claimed to be an eyewitness to suspicious activities at the factory sometime in 1965 or 1966. The worker alleged that one night he and an acquaintance came across a group of unidentified people "loading cans into some equipment" in NUMEC's loading bay. (At the time, canisters about 6 inches long were common for storing various kinds of radioactive materials, Gilinsky said: "You store it in small cans because if you get too much, it's a bomb.") The man said that he also saw shipping papers indicating the material was bound for Israel and that a gun-toting guard ordered the worker and the acquaintance to leave the area. In the same FBI document, another NUMEC employee said that highly enriched uranium was always transported in a "silver-colored can ... approximately the size of a one-quart paint can."

Throughout the 1980s and 1990s, documents detailing the government's concerns about an alleged diversion continued to trickle out. In 1991, investigative journalist Seymour Hersh dedicated a chapter to Shapiro's activities in his book *The Samson Option*, which recounts Israel's nuclear program and U.S.-Israel relations. In it, Hersh concluded that Shapiro had been unfairly railroaded by overzealous CIA spies who judged him to be guilty without sufficient evidence. Hersh argued, like Shapiro had before, that when the plant was being decommissioned beginning in 1978, the government recovered roughly 200 pounds of missing uranium. According to Gilinsky, government agencies extracted the radioactive material from the rubble of the plant and shipped it off to a safe burial site. But that wasn't the end of the story.

In 2001, the Energy Department drafted a report that revealed new details about NUMEC's missing uranium. The study found that in addition to anticipated industrial losses through air and water, 593 pounds of highly enriched uranium were unaccounted for in Apollo between 1957 and 1968—less than half of which was recovered in the decommissioning process. By contrast, over the next nine years, only about 168 pounds disappeared, even though the amount of uranium being processed increased. "A certain amount of loss is reasonable; even a high estimate is reasonable," Gilinsky said. "But this is over and above every estimate of reasonable loss."

The change in the loss rate happened to overlap with shifts in NUMEC's ownership. In 1967, Shapiro sold NUMEC stock to Atlantic Richfield, but kept running the plant for a few years. The engineering company Babcock & Wilcox acquired NUMEC in 1971. Shapiro told Hersh that the diversion controversy essentially forced him to give up his business. "I was a smelly dead fish," he said. "Contracts were pulled away and given to others."

THE ACCUSATIONS against him, however, didn't prevent Shapiro from getting new, prestigious work. In 1970, he returned to Westinghouse, where he focused on a project to develop a new type of nuclear reactor that would create more fissionable material than it consumed. (As Seaborg related in his 2001 memoir, *Adventures in the Atomic Age: From Watts to Washington*, the AEC chairman, shortly before his resignation, helped Shapiro get the job at Westinghouse, which did not require a security clearance upgrade.)

By the 1990s, Shapiro was still living in Pittsburgh, and according to friends and neighbors, he was deeply engaged with his community. "He was a nice man, sort of like a fatherly figure," said Seth Corey, an oncologist who met Shapiro through a Jewish community network. They went to the symphony together; Shapiro, Corey said, loved classical music. While Corey, who has since moved out of Pittsburgh, knew his friend had once owned a company, the controversy around NUMEC never came up. "I just knew he was a nuclear engineer," Corey said. "I didn't know anything about this enriched-uranium stuff."

In 2009, at age 89, Shapiro was still inventing. That year, he filed his 15th patent, a new way of synthesizing diamonds, and his family nominated him for a National Medal of Technology and Innovation, the United States' highest award for science. Shapiro received dozens of recommendation letters, but he wasn't recognized. It's unclear why; the committee declined to comment for this article. After the award denial, Shapiro's daughter, Deborah, reached out to then-Pennsylvania Sen. Arlen Specter to help in her efforts to exonerate her father. Specter agreed and lobbied the NRC on Shapiro's behalf. But in a November 2009 letter to the senator, the NRC said it was unable at that time to "unequivocally conclude that nuclear material was not diverted from [NUMEC] nor that all previously unaccounted for

Today, many people in the nuclear and intelligence communities are still convinced that a diversion occurred. "I tend to think it happened," Stockton said. "In fact, I'm damn sure it happened."



MANY PEOPLE IN APOLLO ARE GRAPPLING WITH FEARS THAT NUMEC POISONED THEIR TOWN AND GAVE RESIDENTS BREAST, THYROID, AND OTHER CANCERS.

material was accounted for during the decommissioning of the site."

Today, many people in the nuclear and intelligence communities are still convinced that a diversion occurred. "I tend to think it happened," Stockton told me. "In fact, I'm damn sure it happened." But the believers also concede that the evidence against Shapiro remains largely circumstantial; the nail in the coffin, they say, would be a confession from the aging founder of NUMEC or the release of a yet-to-be-identified document that would show definitive proof. Neither, however, appears forthcoming. Sensitive documents are generally declassified in the United States within 50 years (though this timeframe is up to the president's discretion). The 1954 Atomic Energy Act, however, provides for an exemption concerning anything related to "atomic information" and gives government agencies broad leeway to keep information classified indefinitely if it could potentially harm U.S national security.

Others argue that Shapiro has been unfairly maligned. "Shapiro would like to have rehabilitation," said Monterey's Avner Cohen. "A lot of people believe a great deal of injustice was done to him. I don't think there's any definitive, clear smoking gun."

I made repeated attempts to speak to Shapiro, including several hours spent on the phone with Deborah, all of which she insisted be off the record. In the end, I showed up on Shapiro's doorstep in Pittsburgh in January, but Deborah said her father and mother were both ill and could not speak to me. In 2012, Shapiro, in a roundabout way, hinted to a Pittsburgh news website, *Trib Live*, that the missing uranium might still be buried in the ground around Parks Township: "There is far more material there than the Atomic Energy Commission inspectors had estimated," he said. In late 2013, Shapiro talked to a *Wall Street Journal* reporter and again denied having anything to do with a diversion.

THERE IS A CHANCE that when the spades hit the ground again at Parks Township in 2017, the quantity of the extracted materials there could erase any lingering doubts about a diversion. This is unlikely, in part because of the near impossibility of proving that whatever is there didn't come from some other nuclear site that happened to use the area as a dumping ground. And as long as key national security documents, in particular CIA files, remain redacted and unavailable for the public, questions about what they prove or disprove will fester.

Meanwhile, Apollo Mayor Jeff Held just wants the whole sorry tale to go away. As we drove back into his town on that recent January day, Held took me to see some local highlights—a multi-million-dollar high school football field, the town's first log cabin, a big park where families spend lazy summer afternoons. "There was a time when all anybody around here could talk about was NUMEC," he told me. "But we're trying to move into the future now."

A few years back, Hollywood scouted Apollo as the setting for the movie *Promised Land*, starring Matt Damon and Frances McDormand. In the film, activists concerned about how fracking operations might ravage the local environment fend off a corporation eyeing their small town. The story has eerie parallels to Apollo, except that in the real-life case, residents welcomed the arrival of an energy company and have since seen their town's land and, in some cases, their own health destroyed. Still, to Held, his home is a promised land. That's why he never left. "That whole nuclear industry thing is part of our legacy. We don't deny it," he said. "But we're not allowing it to define us." ■

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UNEXP

Is low-dose radiation deadly? Scientists still don't know. Why it might take more than 1 million people and a lot of mice to find the answer.

By SARAH LASKOW

At 6:45 a.m. on March 1, 1954, the earth rumbled beneath 10-year-old Jalel John's feet as she stood on Ailuk Atoll in the Marshall Islands. Above her, half the sky turned strange colors. She remembers, in particular, the reds—the uncanny shades of red. Within six minutes, a mushroom cloud reached 130,000 feet overhead, pulling with it the pulverized coral of islands. Left behind was a crater that measured more than a mile wide and 250 feet deep, vast enough to be visible from space. Some 350 miles away from the blast, John experienced the largest thermonuclear explosion that the U.S. military would ever detonate, a test known as Castle Bravo. (It reached a yield of 15 megatons; in layman's terms, that's 1,000 times more powerful than the bomb dropped over Hiroshima.) Then came the fallout. At around noon, a white, powdery substance began to drift down from the sky—first onto Rongelap Atoll, some 100 miles east of the explosion, and then onto Utirik Atoll, 300 miles away from the blast. On Ailuk, where John lived, a fine fog filled the air, finally settling on the earth and the atoll's enclosed lagoon.

POSED

The following day, U.S. military planes flew over these islands, measuring radiation levels in the atmosphere. In the evening, an Air Force seaplane landed on Rongelap. The two men who got out of the aircraft were there for no more than 20 minutes and didn't speak to anyone. They recorded high levels of radiation: The islanders' total dose was estimated to be between 110 roentgens—enough to induce vomiting and cause muscle aches—and 340 roentgens, which could kill a person. By the next morning, the *USS Philip*, a slim, gray battleship, had arrived to evacuate all 65 people on Rongelap. Shortly after, the U.S. Navy moved 154 people off Utirik.

But John and some 400 other residents remained on Ailuk. The total dose of radiation they had received, estimated at a maximum of 20 roentgens, "would not be a medical problem," an Air Force lieutenant colonel reported to command that week.

In 1994, 40 years after Bravo, Holly Barker, an advisor to the Marshall Islands' ambassador to the United States, was assigned to document the stories of so-called "unexposed" communities, including those on Ailuk. Scores of women, she says, shared personal stories of stillbirths and malformed "grape" babies. Jalel John, by then about 50 years old, was one of them: Two of her children had died, and one of them "was born defective," she told Barker: "It didn't look like a human. It looked just like the inside of a giant clam."

John invited Barker into her home, where she insisted that the young advisor take a picture of her granddaughter—a moment that sticks with Barker, even years later. A young girl wearing a colorful patterned dress stood in the middle of a rough, empty floor. The girl's big, dark eyes stared into the camera. Her right arm reached to her kneecap and rounded into a fleshy nub at her wrist, while her left arm was a stump. Her legs, covered mostly by the dress, were uneven, and one twisted outward. What John was trying to convey, Barker remembers, was, "This is it: I'm exposed, and this is what we're dealing with." But such visceral images had not altered the U.S. government's official position that the only people affected by radiation were those who were originally evacuated.

In the 1950s, the U.S. government may have had the best of intentions when it told the residents of Ailuk that they were safe, but technically speaking, authorities weren't in a position to offer those

assurances. What U.S. government scientists said at the time was that below 25 roentgens, they could not see any effects on a person's body. But they allowed for the possibility that, over time, small amounts of radiation exposure might cause genetic damage. In other words, the most reliable science of the era could not measure the effects of the relatively low levels of radiation that reached Ailuk.

Today, despite the 2,053 nuclear weapons tested around the world during the Cold War, the more than 430 nuclear power plants currently operating in 31 countries, and the skyrocketing use of radiation in medicine—annually, there are 20 million nuclear-medicine procedures in the United States alone—scientists are still uncertain about those risks. The estimated total levels of radiation that reached Ailuk were ultimately determined to be less than 10 roentgens. By today's safety standards, such levels would be less than what is referred to as "low dose," which is anything below 100 millisieverts (mSv), the metric measure now used, or roughly equal to 10 roentgens.

Over the past 17 years, the U.S. Energy Department has invested in more than 240 projects, at a cost of over $130 million, to discover the effects of low-dose radiation on humans and the environment, to no avail. This January, the House of Representatives passed a bill calling for a new road map for low-dose research to find a science-backed reason to end what are—in the words of House Science Committee Chairman Lamar Smith, a Texas Republican—"overly restrictive regulations" on nuclear industries. Although the bill appears on its face benign, calling for coordinated efforts by scientists to finally get to the bottom of low-dose exposure risks, its goal is to discredit the so-called "linear no-threshold" (LNT) model, which has formed the basis for radiation safety policy for decades. This model assumes that radiation at any dose is harmful—an approach used by regulatory bodies, both in the United States and internationally. While most scientists agree that the LNT model offers a reasonably conservative guide for establishing standards, they know it's based on an estimate—and they understand that, eventually, studies will pinpoint the exact effects of radiation at low doses.

Clarifying uncertainty over a long period of time is normal and necessary in science, where consensus can come at a glacial pace, but in the hands of U.S. policymakers, scientific examination can quickly get amped up and politicized. The legislative calls for more research could be discounted as political minutiae, but not having the answer to the LNT puzzle could already be having tangible—even deadly—consequences.

Those, like Lamar Smith, who oppose the LNT model, believe there is a threshold of exposure below which harm is either nonexistent or of no consequence. But even as it stands, America's occupational radiation dose limits are more than twice those of international standards and are notably high among nuclear countries' safety regulations. To make matters worse, government officials have avoided setting strict standards for resettlement and compensation plans for victims of a nuclear attack or accident. Stunningly, children's greater sensitivity to radiation is not even accounted for in nuclear safety regulations.

To put it simply: The new bill places scientific inquiry in the service of a deregulation agenda that could make people less safe—not more.

BEFORE 1945, WHEN THE UNITED STATES DROPPED LITTLE BOY over Hiroshima and Fat Man over Nagasaki, no one knew much about the dangers of radiation. Today, those nuclear bombs aren't just the only ones ever used in war; they're also the sources for much of what is known about how radiation affects the human body. In 1950, scientists began the Life Span Study, an epidemiological examination that continues today of the tens of thousands of people who were within about a six-mile radius of the points directly below the detonations. The project tracks the radiation-exposure outcomes over a person's lifetime. The results haven't been good: The greater the dose of radiation, the greater the risk of death, period.

There are limits, however, to what scientists can learn from this one group of people. The Hiroshima and Nagasaki populations were exposed to an external blast of radiation over a relatively short amount of time; the results in that case cannot be applied to other situations, such as people eating radioactive food or working for decades in a nuclear weapons plant. But after a couple of decades, the study found that the people who had been exposed to lower doses—and who had not shown signs of health effects before—started developing cancers that were once connected only to high exposures, such as thyroid, breast, and lung cancers.

In 1979, scientists working on the National Academy of Sciences' third BEIR (Biological Effects of Ionizing Radiation) report were divided sharply over how to estimate these low-dose cancer risks. Some scientists thought there was still a "safe" threshold of exposure; others asserted that the risks of low-dose radiation were exponentially smaller than those of higher doses. But BEIR Committee Chairman Edward Radford argued heatedly that, proportionately, the risks were the same at high and low doses. He said that the best solution was to extrapolate, all the way down to zero, the linear relationship between dose and effect observed at higher doses. Although the report ultimately presented all sides of the debate, by the next BEIR report, in 1990, Radford's view had won out. The LNT model has remained in the report ever since and has guided decisions not only in the United States, but around the world.

About that same time, in the 1990s, scientists were finding new, large populations to examine, groups that could fill in some of the gaps left by the Life Span Study. As the Cold War ended, scientists in the United States and Western Europe gained access to the Techa River cohort—29,800 people who lived on a small river that passed by the Soviet Union's Mayak nuclear weapons complex. After the plant began producing

plutonium, its waste was dumped from 1949 to 1956 into the river, where it seeped downstream, went into the water table, and contaminated the population's drinking and bathing water, as well as its food crops.

In contrast to Japan's bomb survivors, this group was exposed to radiation in dribs and drabs—exactly the sort of exposure that had been assumed, previously, to pose little threat. But over the past decade, an international team, connecting scientists in Russia and the United States, has found that these low doses, even if they were spread out over years, did increase the risk of developing cancer. The number of cancers was small: In one study, the researchers found that 3 percent, or 55 out of 1,836, of solid cancers that appeared in those tens of thousands of people near the Techa River were attributable to radiation. But it is significant that they showed up in the results at all—and that the relationship between dose and effect looked to be linear.

NOT HAVING THE ANSWER TO THE LNT PUZZLE COULD ALREADY BE HAVING TANGIBLE—EVEN DEADLY—CONSEQUENCES.

In 1988, another study, by the French-based International Agency for Research on Cancer (IARC), began to pool data about nuclear workers, ultimately almost 600,000 from 15 countries. It was hoped that this group, one of the biggest samples ever studied, would reflect more clearly the true effects of low doses. And, indeed, the IARC's estimates of the workers' cancer risk, first published in 2005, not only showed that chronic, low doses posed threats, but also that they were notably higher than those predicted using the LNT model. The problem was that the results were influenced heavily by one data set from Canada: Without it, the increased risks that the study showed were no longer statistically significant from zero. Almost immediately, the study was criticized, most vocally by scientists who'd worked in the nuclear industry. In 2013, the Canadian data set was thrown out.

That certainly doesn't look good. But in a study like the IARC's, any dramatic outlier demands further investigation—that's part of good science. (And independent academics are working to salvage the Canadian data set, so it may still be used in the future.) The real problem, some scientists say, is not that this one data set was thrown out. It's that, with doses and risks this small, scientists need to study more than hundreds of thousands of people, as in the IARC study. They need on the order of at least 1 million to nail down precise results. (That's just how statistics work: Real-world data don't come perfectly fit to a model. If only one out of 1,000 exposed people are expected to develop cancer attributable to radiation, small discrepancies can have a meaningful impact on a best-fit curve.)

With that in mind, John Boice, head of the U.S. National Council on Radiation Protection and Measurements—and an expert who's not necessarily convinced that the LNT model is the best representation of risk for very low doses—is cobbling together the largest radiation cohort ever: more than 1 million Americans exposed to radiation while working at nuclear plants, with the military, or in other radiological industries. He has been planning this project since he first pushed the Nuclear Regulatory Commission (NRC) to start a registry of nuclear workers nearly three decades ago. It could take another seven years—plus about $25 million on top of the $10 million or so he has already received from the Energy Department, the National Cancer Institute, the NRC, and other funders—before he is done. "When we finish this investigation," he says, "we'll be able to address directly the effects of low-dose rate radiation."

While Boice was busy jump-starting his study, lab researchers enabled by new technology in the late 1990s were making headway on how low-dose radiation affects human cells and animals. By zapping a single cell with a microbeam of radiation, the lab scientists were able to look at radiation's effects on cells at lower doses than ever before. And what they found surprised them.

"It was always assumed—I always assumed—that what happened when you went to lower doses was that less and less cells got damaged," says David Brenner, the director of Columbia University's Center for Radiological Research. "So there was less and less probability that any cell would produce cancer." But when researchers hit just one cell with radiation, not only that cell, but those near it, were also damaged. This became known as the bystander effect.

"Because cells talk to each other, they send out signals," Brenner explains. "We don't understand how those mechanisms work, but there's no doubt whatsoever that a cell that's unaffected by radiation can have DNA damage in it if it's near to a cell that is affected by radiation."

This idea suggests that the LNT model underestimates risks. If, say, twice as many cells are damaged by a hit of radiation than assumed, it's a fair guess that the health risk would be twice as high. Certainly, this discovery eventually meant that, as Brenner puts it, "all bets are off" on the accuracy of the LNT model at low doses.

Indeed, by the late 1990s there was enough evidence calling into question the LNT model that the cracks in its foundation interested the

Energy Department, which devoted resources to wiggling those cracks even wider. Starting in 1998, the department's low-dose lab studies involved irradiating single layers of cells, tissue-like cell groups, and mice, with doses under 100 mSv. The results showed a plethora of "non-targeted effects," where, as in the bystander effect, cells other than the one that was irradiated responded to the dose. But if the epidemiological studies support the idea of extrapolating from high to low doses, this body of work shows that the relationship between high- and low-dose risks is probably more complicated than that. And it's still unclear what, exactly, any of this means for human health.

Scientists, including those most closely associated with the Energy Department's program, are focused on lab studies that show that some of these cell-level responses are protective, rather than damaging—that is, the neighboring cells are merely gearing up to fix minor damage. For these reasons, Tony Brooks, who worked as the program's chief scientist for years, is matter-of-fact: "I personally don't think that low doses are important at all in cancer-risk assessment." The program has also funded scientists who believe in radiation hormesis—the idea that low doses of radiation might actually be beneficial.

Some of Brooks's colleagues will say, politely, that these conclusions about the LNT model's overestimation of risk are going much too far. Their doubts about hormesis are even more profound. To conclusively prove radiation risks, these two lines of research—the epidemiology and the lab work—will likely need to come together. This means that the lab models will have to show what the complex relationship of dose and effect does indeed look like, if it doesn't look like a straight line, and this relationship will have to match with the real-world data from human populations.

This situation isn't so unlike that in Europe, where the LNT model also has caused quite a kerfuffle among scientists. Most notably, the French Academy of Sciences' position, since 2005, has been that the LNT model may overestimate risks (though that hasn't changed France's safety policies). But, compared with the United States, there's a stronger inclination across the Atlantic toward the view that the risks might actually be higher than previously assumed. In 2009, an association of government agencies and research institutes in Europe, called MELODI, started a decades-long program that aims to nail down, once and for all, the true impacts of low-dose radiation, with the aim of assessing and improving Europe's current system of radiation protection. This is slow-going work, and rigor and patience may yet prevail over politics.

Meanwhile, in Washington, the House bill on low-dose research awaits Senate approval. According to its lead sponsor, Rep. Randy Hultgren, a Republican from Illinois, the goal of the act isn't to challenge that a threshold exists, but to "ensure that the Department of Energy's Office of Science prioritizes the research necessary to understand what that level actually is." He points to medical innovations, such as X-rays, as things that have benefited the public good while also relying on low-dose radiation to do so. "It is essential we have the science and facts straight before taking any potentially burdensome regulatory actions that could hamper future innovation," he said in a January statement.

Edwin Lyman, a senior researcher at the Union of Concerned Scientists who specializes in nuclear proliferation, isn't so optimistic things will change for the United States in the same way they could for Europe. At the NRC and Energy Department, he charges, institutional bias "motivates the grant selection of the people who are directing the grants, so they're self-selecting a population of studies that support their own view."

GREGORY JACZKO, WHO CHAIRED THE NRC UNTIL 2012, doesn't discount that "there is an industry-influence piece" to this particular scientific debate. In short, changes cost money.

Those who oppose the LNT model argue that low, allowable dose levels keep the business of nuclear cleanup thriving. Cleaning up a site to 0.15 mSv per year, the Environmental Protection Agency's standard, rather than 0.25 mSv, the NRC's, can cost millions of extra dollars. And when considering decommissioning nuclear plants, the NRC has been more concerned with that cost differential than with the differential in human health. The Energy Department already spends $5 billion each year on environmental cleanup for its atomic defense work. (Almost half of that goes to just two nuclear production sites now being decommissioned, Hanford and Savannah River.) As an example, cleaning up New York City to that 0.15 mSv standard—after a hypothetical nuclear event, that is—could cost approximately $4 trillion; to clean it up to 50 mSv would cost less than $1 trillion.

Over the past 15 years, the NRC has discussed updating the United States' occupational dose limit, which governs how much radiation people who work in industries like nuclear power and nuclear medicine

can receive each year, by lowering it from 50 mSv to 20 mSv per year, the limit first recommended by the International Commission on Radiological Protection (ICRP) in 1991. Today, the NRC's workplace-safety regulations are less stringent than other countries'—and they are still based on recommendations that the ICRP published 38 years ago, in 1977.

In 2010, the NRC staff arranged three stakeholder meetings to discuss potential changes to nuclear safety standards, including lowering the occupational dose limit. According to transcripts of those meetings, the industry representatives said almost universally: Don't.

TO CONCLUSIVELY PROVE RADIATION RISKS, THESE TWO LINES OF RESEARCH—THE EPIDEMIOLOGY AND THE LAB WORK—WILL LIKELY NEED TO COME TOGETHER.

They had plenty of reasons. For one, the change wasn't necessary. Because they work to keep exposures—in the jargon of nuclear regulation—"as low as reasonably achievable," some industries, such as the nuclear power sector, were already keeping their workers well below the 20 mSv-per-year standard that many European countries use. (One radiation-protection manager, Willie Harris, estimated that "roughly … about 83 individuals" across the entire industry were receiving a greater dose.) A representative from Oak Ridge National Laboratory argued that a lower limit would force contractors to step up expensive monitoring or that they might have to switch from urine samples to fecal samples to measure internal doses. Higher costs came up frequently. A representative from a radiopharmaceutical company said that stricter limits could cause whole medical-scanning industries to shut down. Most of their exposed workers were receiving doses higher than 20 mSv per year, and if they had to hire more people in order to reduce each worker's exposure, the economics of the whole business would stop making sense.

But one of the main ways that the industry representatives, particularly those from the medical sector, justified their position was the uncertainty surrounding low-dose effects. By this flawed logic, what's not proved to be dangerous should be assumed to be safe. The public, however, tends to take a more risk-averse position, thinking that what's not proved safe should be assumed dangerous.

"I'd have people come in and meet with me and say, 'We think the power plant is making our kids sick,'" says Jaczko, referring to the three years he headed the NRC. When he'd tell them that the commission hadn't seen any worrisome health problems among workers in their area, the parents would always have a similar counterargument: Children may be more susceptible to radiation risks. Currently, the commission calculates doses to the public by modeling, primarily, how radiation affects an adult, not a child. When it updates its safety rules, according to a 2014 NRC report, the commission plans to include creating "a more realistic representation" of the public.

Although scientists know children are more vulnerable to radiation, they're unsure exactly how *much* more. In 2013, the United Nations' scientific committee on radiation effects said that children could be up to three times more sensitive "for some health effects but certainly not for all." For a parent, however, doubling even a small risk to a child may well be unacceptable. And the health effects to which kids are clearly more susceptible are not to be understated: leukemia, as well as thyroid, skin, breast, and brain cancers.

The 2011 nuclear accident that unfolded in Fukushima, Japan, illustrates how these dangers play out in real life. When a World Health Organization panel assessed the health risks to the people exposed to radiation during the accident, it found that, overall, the increased incidence of cancer was likely to "remain below detectable levels." But the panel also found that infants were at the highest risk. (While they were exposed to external and internal radiation like everyone else, they also would have ingested their mothers' breast milk, where radiation concentrates.)

In the worst-affected areas, where doses were estimated to be between 12 and 25 mSv in the first year after the accident, the lifetime risk for leukemia has increased

7 percent for male infants, according to the panel, while female infants have a 4 percent greater risk of all solid cancers and a 6 percent greater risk of breast cancer. Females exposed as infants, the panel also found, have a 70 percent greater lifetime risk of developing thyroid cancer. Recently, these statistics have begun to play out in reality. Researchers at the Fukushima Medical University have detected increased rates of thyroid cancer in children. This could be an artifact of stepped-up monitoring, as regular thyroid cancer screenings hadn't been part of normal pediatric visits. But anti-nuclear activist Helen Caldicott says that argument, made by Japanese medical officials, is a thin excuse. Authorities, she says, "don't want to admit Fukushima could cause any disease at all."

In the aftermath of Japan's nuclear accident, the country's general public is being pushed to take on more risk of chronic exposures. Last year, some of the first evacuees from the area around Fukushima returned home to contaminated areas that have been cleaned up, but not entirely. Members of the public can now legally receive higher radiation doses than they could before the disaster: 20 mSv per year—the same as most nuclear workers—compared with the previous 1 mSv limit.

And while the difference between 1 and 20 mSv might not matter to a 95-year-old whose priority is simply returning home, for someone younger, with an infant, 20 mSv is a different issue. Where to set standards, Jaczko points out, is not science—it's a societal, moral, and ethical debate. "It's easy to say, one company's $10 million bill is not OK compared to my one-in-a-million chance [of getting cancer]," he says. "But if you did get cancer, you'd feel pretty bad—if you could prove it and show it. And we can't."

When U.S. policymakers and their advisors have looked at resettlement in the wake of nuclear-disaster scenarios—most recently with a February report from the National Council on Radiation Protection and Measurements (NCRP) on recovery from major nuclear or radiological incidents—they have favored working with communities to determine "acceptable risks" rather than setting down a bright-line rule. In the report, says the NCRP's Boice, "we don't say 'mSv.' We say, 'You have stakeholder involvement, and we say you get as low as reasonably achievable.'"

If that sounds Orwellian, that's because it is.

IN 1968, THE ATOMIC ENERGY COMMIS-sion (AEC)—which oversaw nuclear safety until 1975, when the agency was dissolved and its responsibilities assigned to today's NRC and, ultimately, to the Energy Department—determined that the dose to which any returning Marshallese would be exposed would be no more than 20 mSv over five years. And so the residents of Bikini Atoll, who had been relocated because of the nuclear tests long before the people of Rongelap and Utirik, were allowed to return home. Robert Conard, who ran the AEC's medical program in the Marshall Islands for two decades, wrote in 1992 that the doses there were "so low that medical surveillance was not considered necessary." While scientists knew that it was still possible that low levels of radiation could concentrate in the food chain, they did not communicate that clearly to the resettled Bikinians. "We drank coconuts and ate pandanus [a tropical fruit] all the time," one elder later reported in 1989 to American researcher Jack Niedenthal. "We were always under the impression that everything was safe and that we could go about our everyday business and not worry....

WHERE TO SET STANDARDS, JACZKO POINTS OUT, IS NOT SCIENCE—

Then the Americans started changing the rules on us."

Out of caution, the AEC annually screened the resettled population and measured environmental radiation levels. By the late 1970s, those tests showed something alarming: The Bikinians' body concentrations of radiation were heading toward the maximum allowed levels. They were evacuated again.

But internal exposures weren't the only surprises in the Marshall Islands. On Utirik, islanders had been told they shouldn't expect any major medical problems; however, when doctors conducted three-year examinations, they started finding lumps at the bases of patients' necks, around the area of the thyroid. By 1987, 19 of the some 160 people originally exposed to radiation on Utirik had had thyroid tumors removed, 15 of them nonmalignant and four of them cancerous.

IT'S A SOCIETAL, MORAL, AND ETHICAL DEBATE.

While the initial exposures at Utirik (later determined to be around 140 mSv) were considered low in 1954, now they're clearly over the 100 mSv level at which epidemiologists can estimate radiation's health effects with certainty. Exposures in places like Ailuk and the rest of the Marshall Islands remain controversial.

In 1986, the United States and the Marshall Islands entered into a compact of free association in which the Pacific nation granted the United States continued access to parts of its territory in exchange for military protection and other services. The United States agreed to pay $150 million in compensation for nuclear testing and set up a health program for survivors. But in 2000, the Marshallese government asked Congress for another $3 billion, to be used mainly for continued health-care services and to cover the outstanding $2.3 billion in awards the Islands' Nuclear Claims Tribunal had made.

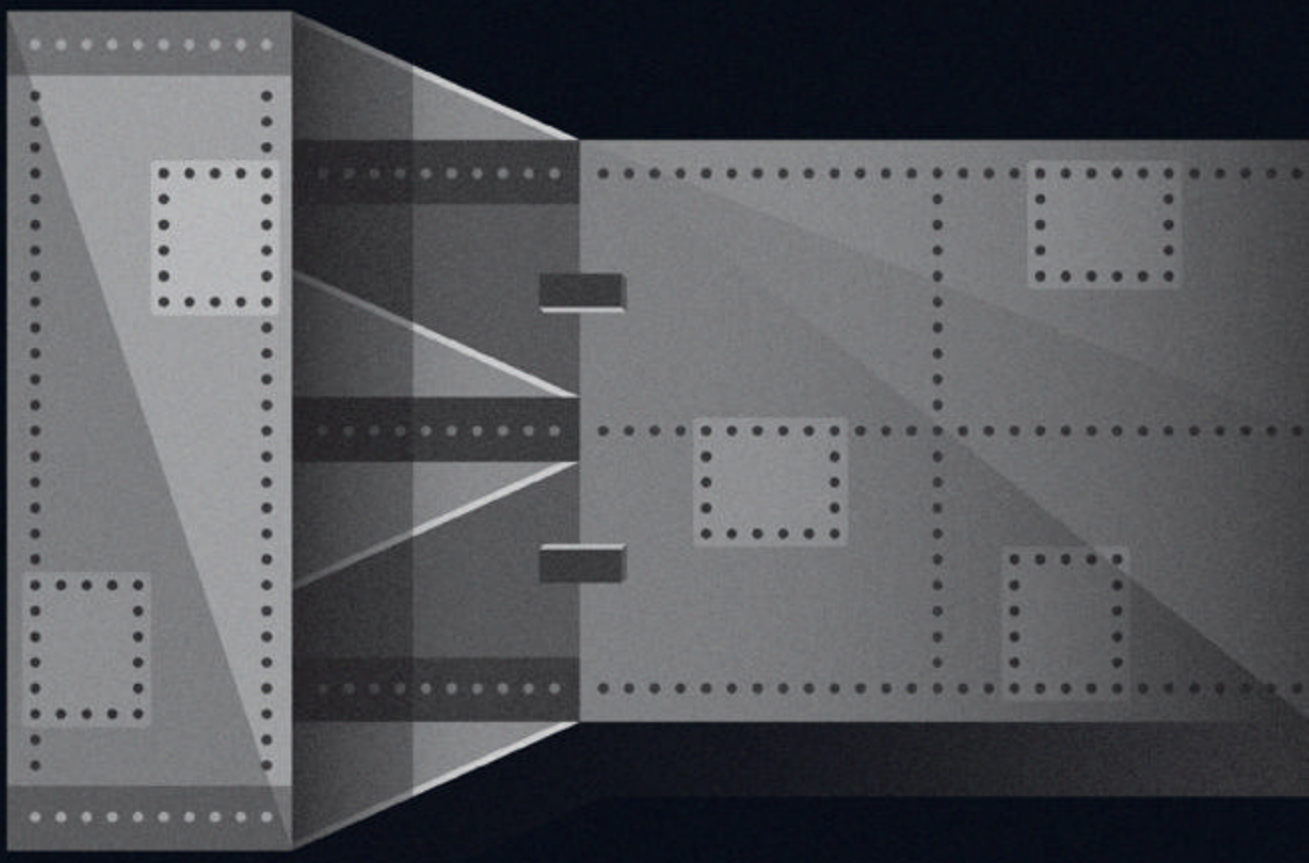
The United States won't pay the bill. The political fight over this compensation—as well as whether Washington should award it—centers, unsurprisingly, on the low doses received outside Utirik, Rongelap, Bikini, and Enewetak, the four atolls that the United States recognizes as having been exposed to Bravo's radiation. The State Department wrote in 2004, for instance, that "U.S. radiation-related compensation programs require proof of a minimal level of exposure" and that "[t]here is no similar basis," in the Marshall Islands, for "recognizing the claims … of individuals located south of ten degrees north latitude."

Ailuk lies just north of that line, right on the cusp of where science can accurately quantify the risks. Today, when evacuation zones are defined by a dose range, such lines are pretty arbitrary, says Brenner, the Columbia University radiobiologist. "It could easily be a factor of two less, a factor of two more, and that would radically change what the evacuation zone would be," he says. "You see people's lives being turned upside down on a permanent basis for something that we simply don't know enough about. Ultimately, we have to make an arbitrary policy decision."

This is what has kept people like Jalel John in limbo, certain that they were damaged by radiation, but told over and over again that they were not. It's only when policymakers stop working the margins—using uncertainty to advance their own agendas—that the public will be closer to understanding even the most mundane, but nowhere near inconsequential, implications of the nuclear age. ■

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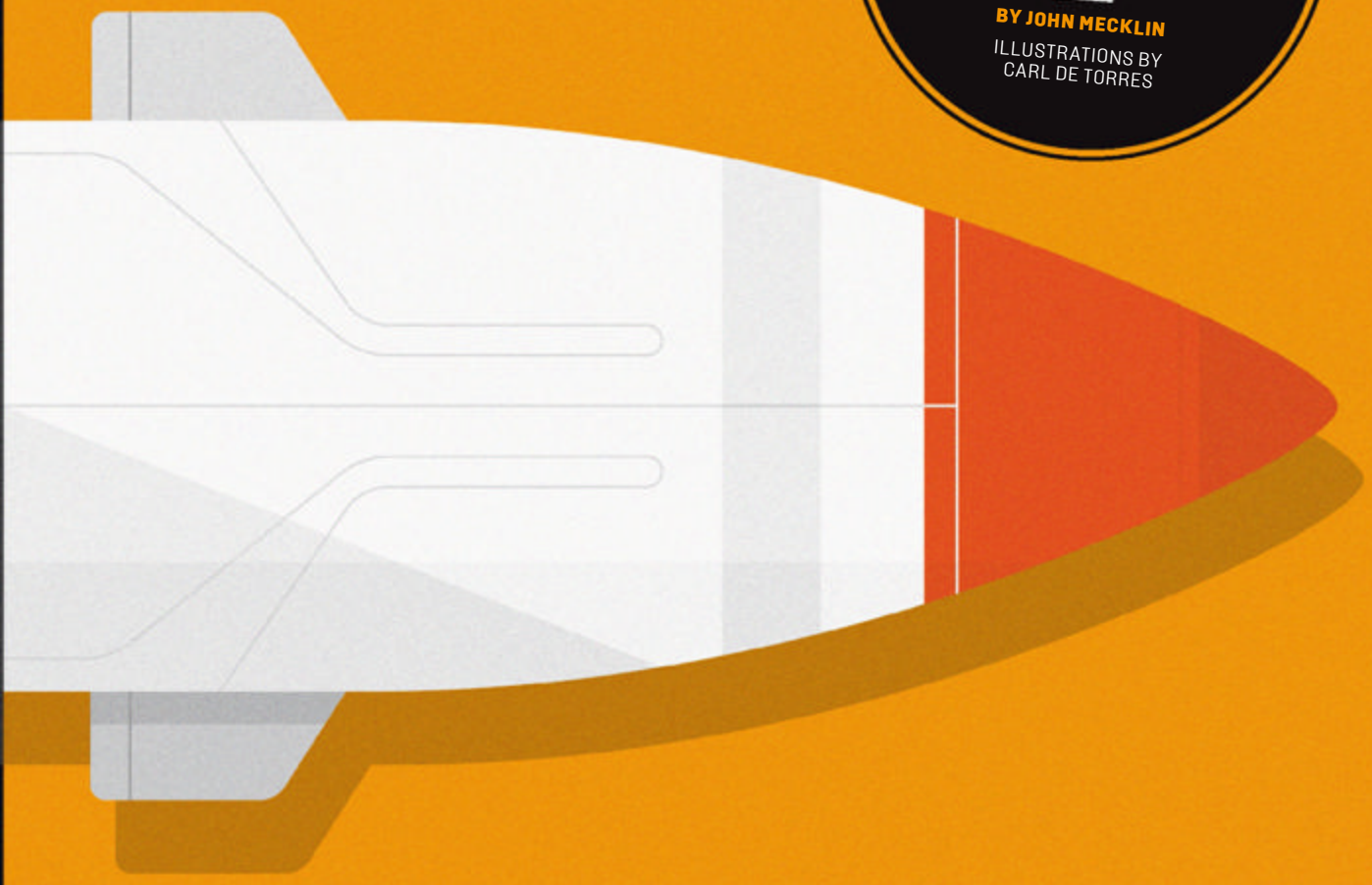
MAND

RNIZE

In terms of warhead numbers, the nuclear arms race may be over. But massive weapons upgrades now underway challenge the entire disarmament regime.

BY JOHN MECKLIN

ILLUSTRATIONS BY CARL DE TORRES



In the early decades of the Cold War, NATO made arrangements to bury what were known as atomic demolition munitions (in essence, nuclear mines) at key points in West Germany, to be detonated if Warsaw Pact forces ever invaded. Although this plan, if enacted, might have slowed the enemy advance, it also almost certainly would have turned vast West German territories into radioactive wastelands littered with corpses and smoldering buildings—the stuff of hellish alternative-history scenarios. The West viewed such tactical nukes—NATO fielded 7,000 to 8,000 of these shorter-range, smaller-yield weapons for most of the Cold War—as tripwires in anticipation of the Soviet Union's own Strangelovian plans for its thousands of tactical weapons. That is to say, the forward positioning of these nukes was a signal: If the Soviet Union invaded Europe, confrontation would escalate quickly to the nuclear realm, and the United States would intervene.

With the end of the Cold War and the reduced risk of a Russian invasion, NATO eliminated almost all its tactical nuclear weapons in Europe. Today, five NATO countries—Belgium, the Netherlands, Germany, Italy, and Turkey—are widely believed to host roughly 200 U.S.-owned nuclear bombs at their air bases. These weapons, variants of the B61 warhead, a stalwart of the American thermonuclear arsenal since the late 1960s, are viewed by some security experts as provocative anachronisms. The critics argue that strategic missiles and bombers posted in the United States and the United Kingdom, along with missiles on nuclear submarines, provide more than enough deterrence against any Russian aggression.

But in the wake of Russia's annexation of Crimea and the destabilization of Ukraine, the controversy about B61s is being heightened and compounded. In addition to retaining tactical nukes in Europe, the United States plans to modernize the weapons, as well as its arsenal back home, in a remarkably expensive way. This decision has inflamed debate about the depth of the U.S. commitment to the Nuclear Non-Proliferation Treaty (NPT), which allows the United States, Russia, China, the United Kingdom, and France to have nuclear weapons if they promise to eventually disarm.

Today, weapons innovation threatens to become the new mode for arms competition. Washington's upgrading of the B61-4 bomb, for example, would equip the device with a tail assembly, making it into a precision-guided standoff weapon. An irony is attached to this redesigned device, called the B61-12: It would be able to attack the same targets as previous gravity bombs in the U.S. arsenal, but would do so more accurately and efficiently, using smaller yields that would create less collateral damage and less radioactive fallout. This means the bombs might be seen as more conceiv-

ably usable in a limited or tactical conflict. And this is precisely why the U.S. Congress rejected the Air Force's requests for low-yield, precision-guided nuclear weapons in the 1990s: Their very accuracy increases the temptation to use them.

Nonetheless, under current plans, approximately 480 B61-12s are set to be produced by the mid-2020s, and they would serve all U.S. gravity-bomb missions contemplated for five different aircraft. In addition to deployment in Europe, the U.S. Air Force also intends to use the B61-12 to arm heavy B-2 and B-52 bombers based in America. Even by the standards of defense budgets, the B61 modernization program is exorbitant: Estimates place its ultimate cost north of $10 billion, or more than if the bombs were constructed of solid gold.

But the high cost and questionable utility of the B61 program are not anomalies—nor is the fact that the plan has received little publicity. Countries with nuclear weapons have recently embarked on highly ambitious and costly programs, largely unexamined outside national security circles, to renew the strategic and tactical weapons in their arsenals. These projects include both technological upgrades and entirely new systems; as documented by Hans Kristensen and Robert Norris, nuclear-arsenal experts at the Federation of American Scientists, the modernizations run the gamut, from ballistic missiles to bombers, warheads to naval vessels, cruise missiles to even weapons factories. Russia is in the process of phasing out and replacing all its Soviet-era nuclear weapons systems. The proposed U.S. maintenance and modernization program has been projected to cost some $355 billion over the next decade and $1 trillion or more over 30 years. And every nuclear country is following suit.

While these efforts will not necessarily increase the number of deployed warheads in the world, the programs and the enhanced weapons they are projected to produce will last for decades. The race for ever-more nukes has become, instead, a race for ever-better, -sleeker, and -stealthier ones. And these transformations and upgrades, designed to make weapons harder to shoot down and more precise and reliable, ensure that the world will be no less dangerous—and perhaps even more perilous—than it is now.

In terms of sheer numbers, the nuclear arms race of the Cold War may be over. But the worldwide modernization craze scrambles the calculus of nuclear disarmament and nonproliferation efforts, challenging the aging underpinnings of the NPT itself. Approximately 16,000 nuclear weapons are still on the planet, and the massive, long-term plans that nuclear nations have in place strongly suggest that they have no intention of giving up their nukes anytime soon. All this makes it reasonable to ask: Is the international arms-control regime an outdated charade? That question will be on the minds of arms experts as the 190 signatories to the NPT convene in New York this spring for a review conference they hold every five years. The mood there, it's fair to assume, is unlikely to be upbeat.

Opened for signature in 1968, the NPT not only allows five states to keep nuclear weapons, but it expressly prohibits the remaining 185 signatories from possessing them. So far, this arrangement has worked reasonably well. At the height of the Cold War in the mid-1980s, for example, six countries (the five nuclear weapons states, as well as Israel) had more than 70,000 nuclear weapons; today, nine countries (India, Pakistan, and North Korea have since joined the nuclear club) possess about 10,000 warheads, with another 6,000 or so "retired" but intact weapons in storage, awaiting dismantlement. The United States and Russia have more than 90 percent of those weapons.

The standard narrative of disarmament asserts that, despite the fits and starts inevitable in international politics, continued arms-control efforts will lead to ever-shrinking arsenals, thereby saving governments enormous amounts of money and improving global security. Among these efforts to date, in addition to the NPT, is the 1996 Comprehensive Nuclear-Test-Ban Treaty (CTBT), which would prohibit all nuclear testing, above and below ground. The treaty has yet to come into force for various reasons. Some states question whether it would be verifiable (even though a body of research strongly suggests it would be), while some officials in nuclear states insist that the option to test should be kept open, to ensure that stockpiles do not become unreliable. Twenty out of 183 CTBT signatory states have not ratified the treaty, including the United States (largely as a result of opposition from Republicans in Congress).

The New Strategic Arms Reduction Treaty between the United States and Russia, which took effect in early 2011, does not require the destruction of a single warhead, but both countries agreed to limit the number they deploy on land- and sea-based ballistic missiles to 1,550 each by 2018. In a 2013 speech at Berlin's Brandenburg Gate, U.S. President Barack Obama proposed that each country cut its deployed warheads by about one-third, to roughly 1,000. Obama also vowed to seek "bold reductions" of nonstrategic nuclear weapons in Europe and to push for Senate ratification of the CTBT.

But disarmament efforts have languished during much of Obama's second term. Almost immediately after the president's Berlin speech, for instance, U.S. congressional opponents and Russian leaders raised objections. Republicans asked whether such cuts would threaten national security, and Moscow decried U.S. missile-defense efforts, saying they threatened Russia's strategic missile force and made new arms cuts impossible. With Republicans taking control of both houses of Congress this year, ratification of the CTBT now seems extremely unlikely.

Numbers show the slowdown in arms-control progress: The U.S. nuclear stockpile was reduced by only about 300 warheads from 2009 to 2013, and Russia retired about 1,000 weapons, Kristensen and Norris have written. These reductions were at a much slower pace than those in the previous five-year period, when Washington nixed more than 3,000 weapons and Moscow roughly 2,500 in a spring-cleaning of outdated and unreliable arsenals. Now, the Ukraine crisis seems likely to further slow the arms-control process. And, in general, the relatively sluggish reduction rate suggests that U.S. and Russian arsenals are not so much headed toward zero as plateauing for the foreseeable future.

In the face of this deceleration, the world's patience is wearing thin. Many of the 185 countries that agreed not to build nukes have become increasingly unhappy. Three conferences held in the past few years on the humanitarian effects of nuclear weapons were seen widely as attempts to force the nuclear powers to move faster on disarmament. The nuclear club largely ignored the first two conferences, sponsored by the governments of Norway and Mexico. But the events had grown to include most of the world's non-nuclear-weapons countries by the time of the third gathering, held in Vienna in December 2014 and sponsored by the Austrian government; more than 150 countries signed up to attend. In the end, the United States sent a representative, though with the disclaimer that "this conference is not the appropriate venue for disarmament negotiations or pre-negotiation discussions."

In Vienna, Ambassador Adam Scheinman, the U.S. president's special representative for nuclear nonproliferation, recounted a rosy history of America's support for a world without the bomb. "It is precisely our understanding of the consequences of nuclear weapons use that drives our efforts to reduce—and eventually eliminate—nuclear weapons," he said, "and to extend forever the nearly 70-year record of non-use of nuclear weapons." Scheinman acknowledged that Washington's approach to disarmament remains an incremental one. But that step-by-step orientation, he said, has led to an 85 percent reduction in Washington's stockpile since the late 1960s, when it peaked at more than 30,000 weapons.

The next day, Richard Lennane, the officially titled "chief inflammatory officer" of the anti-nuclear NGO Wildfire, offered the conference a more acerbic assessment. He likened the nuclear states to alcoholics, addicted to bombs instead of liquor, and urged the international community to stop enabling them. "How long will you listen to the nuclear-armed states expressing their 'unequivocal commitment' to nuclear disarmament and then saying that they need their nuclear weapons for 'stability'? How long will you wait for the mythical 'right conditions' for nuclear disarmament?" he asked. "You can remove the ambiguity that supports their habit.... You can negotiate and adopt and bring into force a treaty banning nuclear weapons."

The disarmament debate is likely to make this spring's NPT conference a contentious one and just might be loud enough to make the public aware that a new type of nuclear arms race is unfolding around the world.

Under the Obama administration, the U.S. national security establishment has proposed upgrades to all three legs of the nuclear triad of land-based missiles, submarine-launched missiles, and long-range bombers, something not done since the mainstay planes and missiles of the current nuclear force were built in the Cold War's early years. The Navy, for example, wants a new class of 12 ballistic missile submarines. The Air Force is reviewing options for a new land-based intercontinental ballistic missile (a mobile missile less vulnerable to detection is one possibility), and it is developing a stealthy long-range bomber to be rolled out in the mid-2020s. The plan is to buy 80 to 100 of these bombers, some of which will be nuclear-capable, at a cost of more than $55 billion. Washington also intends to deploy a new, stealthy, nuclear-capable fighter-bomber—the F-35A Lightning II Joint Strike Fighter—to its allies in Europe, including Italy, the Netherlands, and Turkey.

The F-35A is expected to carry the upgraded B61-12 bomb, which, as part of the future U.S. arsenal, would potentially join a program aimed at creating a smaller array of interoperable warheads for submarine and land-based missiles. The planned upgrades to warheads could require that they be tested to ensure they would work, threatening the moratorium on testing that has held since the 1990s. Any tests would undermine hope that the CTBT would come into force. This, in turn, would likely create major repercussions for the international arms-control regime.

To produce the new warheads, the Obama administration has proposed an array of expensive enhancements to what is often called the nuclear weapons complex: eight facilities—three national laboratories, four production plants, and the Nevada National Security Site, where nuclear tests were conducted until the 1990s—that are government owned but run by contractors and overseen by the semiautonomous National Nuclear Security Administration (NNSA), a part of the U.S. Energy Department. Budget constraints, however, make it unclear whether many of these upgrades will ever be undertaken.

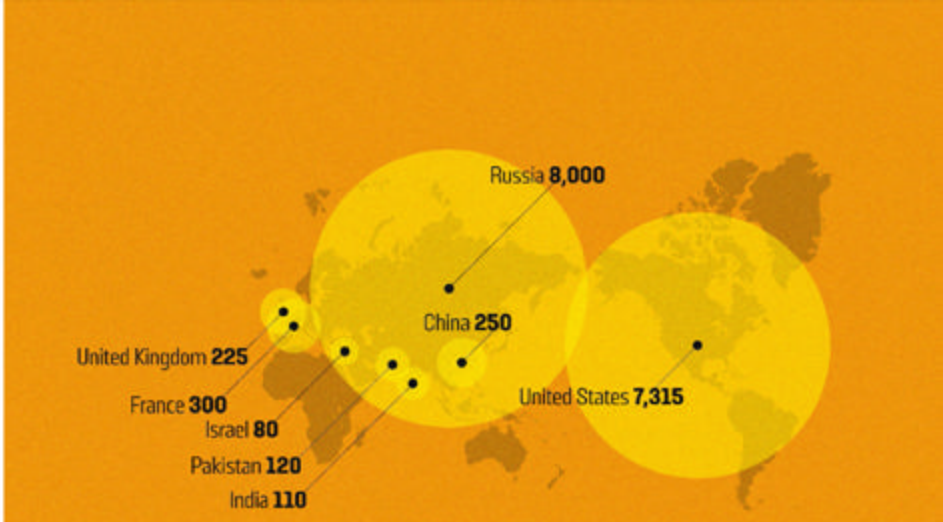
The complex has long had severe management and cost-control problems, as evidenced by multibillion-dollar cost overruns that led the Energy Department last year to suspend work and explore "alternative approaches" to a facility at the Savannah River Site, a weapons plant that would have turned plutonium from retired nukes into fuel for civilian power plants. The management snafus were even more glaringly illu-

minated in 2012, when three activists—one an 82-year-old nun—penetrated multiple levels of security to protest in front of the United States' largest storage facility for bomb-grade uranium. This embarrassing security breach and many other management failures led Congress to create an advisory panel that in November 2014 recommended a major overhaul, including elimination of the NNSA and placement of the nuclear weapons complex under the direct control of an Energy Department rebranded as the Department of Energy and Nuclear Security.

It is unclear whether Congress will pay heed to the recommendations of this panel—one in a long line of commissions to study hapless administration of the nuclear weapons complex—or provide the many billions of dollars that would be needed over time to complete all the proposed upgrades to an infrastructure so old that the ceilings of some facilities are actually falling in.

Although Russia is less transparent about weapons than the United States is, reports by Kristensen and Norris suggest that Moscow intends to phase out and replace all its Soviet-era nuclear systems in the next decade. They note Russia is developing three new land-based missiles, including an SS-27 intercontinental ballistic missile modified so it can carry multiple warheads that can be aimed at different targets, thereby expanding the lethality of each missile. Its ballistic submarines are also set to be modernized, with eight new subs that reportedly will be able to launch 16 missiles, each capable of carrying up to six independently targetable warheads—again increasing the number of targets that can be attacked.

And it doesn't stop there. The Russian bomber force is also being upgraded, with plans for a relatively slow but super-stealthy flying wing, known as the PAK-DA, apparently going forward. A new nuclear-capable cruise missile, long in development, appears to be nearing operational status; the new Iskander-M SS-26 short-range tactical nuclear missile—a mobile system with two missiles per carrier—is being rolled out, and the Su-34 Fullback fighter-bomber is replacing 1970s-era planes as a platform for tactical nuclear strikes. Meanwhile, a nuclear-powered guided-missile attack submarine is about to enter service, along with a long-range cruise missile that may have a nuclear capability. Production of nuclear warheads for these systems continues.



» North Korea also holds nuclear weapons, though the extent of its program remains unknown. (Source: Federation of American Scientists.)

CURRENT STOCKPILES
The United States and Russia have more than 90 percent of the 16,000-plus nuclear weapons on the planet today.

As is the case in the United States, some of Moscow's efforts could significantly alter warhead designs, which would raise questions about whether Russia might seek to test the upgrades, in breach of the moratorium on testing. This freeze is central to the international arms-control regime. Currently four countries that are not parties to the NPT—India, Israel, North Korea, and Pakistan—have nuclear weapons. A resumption of testing could result in more countries trying out and then deploying nuclear weapons. In short, the modernization programs in the United States, Russia, and elsewhere threaten to open the door to a new arms competition—and an ever-increasing number of nuclear weapons states.

In a multipolar world, tomorrow's nuclear arsenals could be managed in unpredictable ways by countries whose governments range from fragile to stable and whose approaches to international affairs range from passive to assertive to even aggressive. The United States' and Russia's race to modernize their nuclear arsenals is paralleled in China, Europe, and South Asia, with countries all seeking to keep up with former Cold War rivals or compete with the military efforts of neighbors.

China, for one, has long professed a goal of minimum nuclear deterrence—that is, an arsenal that is just large enough to inflict unacceptable damage on any country that attacked China first—and is estimated to have about 250 warheads for delivery by land-based missiles, bombers, and an emerging submarine fleet. But China is also engaged in continuing, low-level disputes with its neighbors—the Philippines, Vietnam, and other countries—over control of the Spratly and Paracel island groups in the South China Sea, where Beijing reportedly has been building man-made islands from reefs and shoals to host military facilities. In the latter stages of an aggressive, two-decade program of upgrading its land-, sea-, and air-based nuclear delivery systems, China is the only member of the five NPT-declared nuclear weapons states increasing its arsenal, albeit slowly.

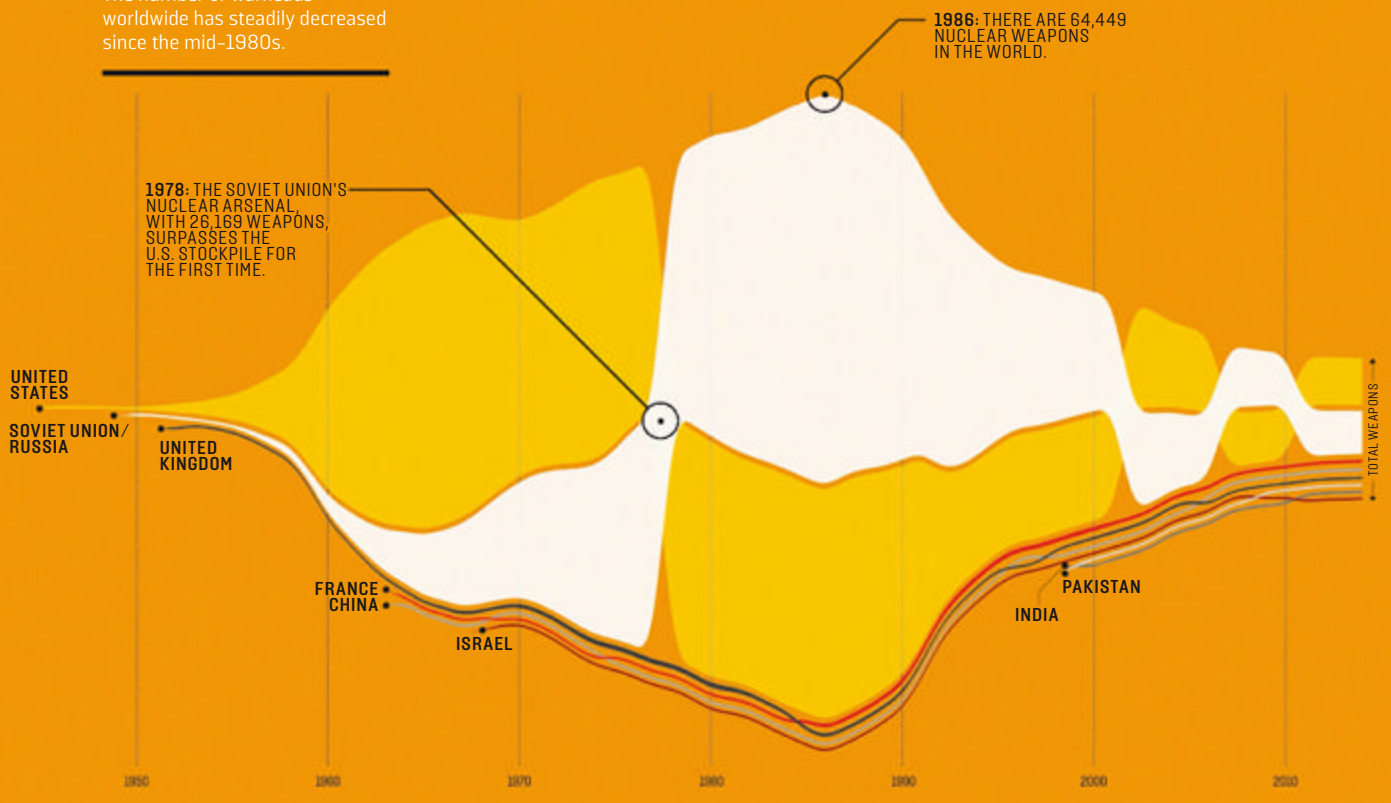
On land, Beijing is significantly upgrading its older liquid-fuel missiles and replacing them with longer-range, road-mobile solid-fuel missiles based at new or upgraded garrisons. This will give a greater portion of China's future land-based missiles longer ranges and more survivability. At sea, the country is in the process of deploying a new design for a ballistic missile submarine. Three of these so-called Jin-class subs have recently been put into service, each apparently capable of carrying 12 single-warhead missiles. This gives the sub fleet the potential to carry 36 missiles, up from the previous total of 12, which were carried on one submarine that entered service in 1986 and is no longer considered operational. The missiles for these new subs, however, are still in development, and it remains unclear how the submarines may eventually be deployed. U.S. intelligence and military sources have suggested that China is adding a nuclear capability to some of its ground- and air-launched cruise missiles, which could greatly increase the number of nuclear-weapons delivery systems in the country. There has been no official confirmation of such a move or how many cruise missiles it might involve. But any production of nuclear-armed cruise missiles would mark a significant change in China's deterrence posture and concern neighboring countries, from Japan to South Korea and beyond, that worry about Beijing's increasingly confrontational ways.

In South Asia, meanwhile, what may be the world's most threatening nuclear face-off—exacerbated by long-simmering distrust and military competition between Pakistan and India, a continuing border dispute over the Kashmir region, and allegations of Pakistani support for terrorist attacks in India—seems to be spawning a modernization race. Both India and Pakistan are upgrading their weapons complexes to produce increased amounts of bomb-grade uranium and plutonium, which would provide the countries with the ability to build more warheads.

Pakistan's expansion is notably rapid. Today, the country has an estimated 120 weapons, an increase from around 90 in 2007. At its current pace, Pakistan could have 200 nukes in its arsenal within a decade. Beefing up its tactical weapons, the country is developing a new medium-range ballistic missile, new air- and ground-launched cruise missiles, and a short-range nuclear missile, the Nasr (officially known as Hatf IX, meaning "vengeance"—a theatrical choice that reflects the nuclear politics of the region). The Pakistani military claims that the Nasr, a mobile system with a range of 60 kilometers (37 miles), is highly accurate and able to carry nuclear warheads. It is designed for

GLOBAL NUCLEAR WEAPONS STOCKPILES, 1945–2014

The number of warheads worldwide has steadily decreased since the mid-1980s.



» The U.S. and Russian figures reflect warheads in military stockpiles, excluding retired, but still intact, weapons. (Source: *Bulletin of the Atomic Scientists.*)

"shoot-and-scoot" warfare—that is, firing at a target and then immediately moving to avoid enemy counterfire—and apparently is meant for use in the event of an invasion by India's conventional forces, widely seen as superior to Pakistan's.

An analysis of the potential use of tactical nukes in South Asia—relying on the outlines of the 1965 India-Pakistan war as a guide to invasion routes—suggests that Pakistan's detonation of just one 30-kiloton battlefield weapon would not only affect invading Indian forces, but also cause the loss of at least tens of thousands and probably hundreds of thousands of Pakistani civilian lives, according to Jaganath Sankaran, an associate at the Managing the Atom project at Harvard University's Belfer Center for Science and International Affairs. In turn, India is developing longer-range ballistic missiles, including the Agni-V—*agni* is the Sanskrit word for "fire"—with a range of 5,000 kilometers (3,107 miles), making it capable of reaching any target in China, its primary regional rival. In addition, India has launched its first ballistic missile submarine, the Arihant, meaning "slayer of enemies" in Sanskrit, which is expected to be followed by several others that will eventually have the capability to launch ballistic missiles. This is significant: Pakistan has long warned that it would consider an Indian submarine armed with nuclear missiles to be destabilizing.

The modernization fervor has also gripped Europe to a degree that could seem unusual for those who view nuclear competition primarily in the historical U.S.-Russia frame. But the nuclear weapons and platforms of European countries are also aging, and these countries continue to have joint defense obligations with one another and the United States. France has undertaken a comprehensive upgrade of its arsenal, deploying an improved submarine-launched missile, the M-51—a multiple-warhead missile with increased accuracy, intercontinental range, and payloads—that will also be outfitted with a new nuclear warhead later this year. An air-launched cruise missile, the Air-Sol Moyenne Portée Amélioré, which has a range of 500 kilometers (311 miles) and an improved warhead, has been integrated into two fighter-bomber squadrons, one at Istres on the Mediterranean coast and the other at Saint-Dizier, in northeastern France.

In 2010, Britain announced its plans to reduce its stockpile to 180 warheads by the mid-2020s, but it is currently bringing out a new class of ballistic missile submarines to replace older submarines scheduled for retirement, starting in 2024. It seems likely that the B61-12 bomb and the deployment of the U.S. stealthy F-35A fighter-bomber in Europe will enhance NATO's overall nuclear capability across the region while simultaneously raising concerns about a lowering threshold for nuclear weapons use during a time of East-West tension.

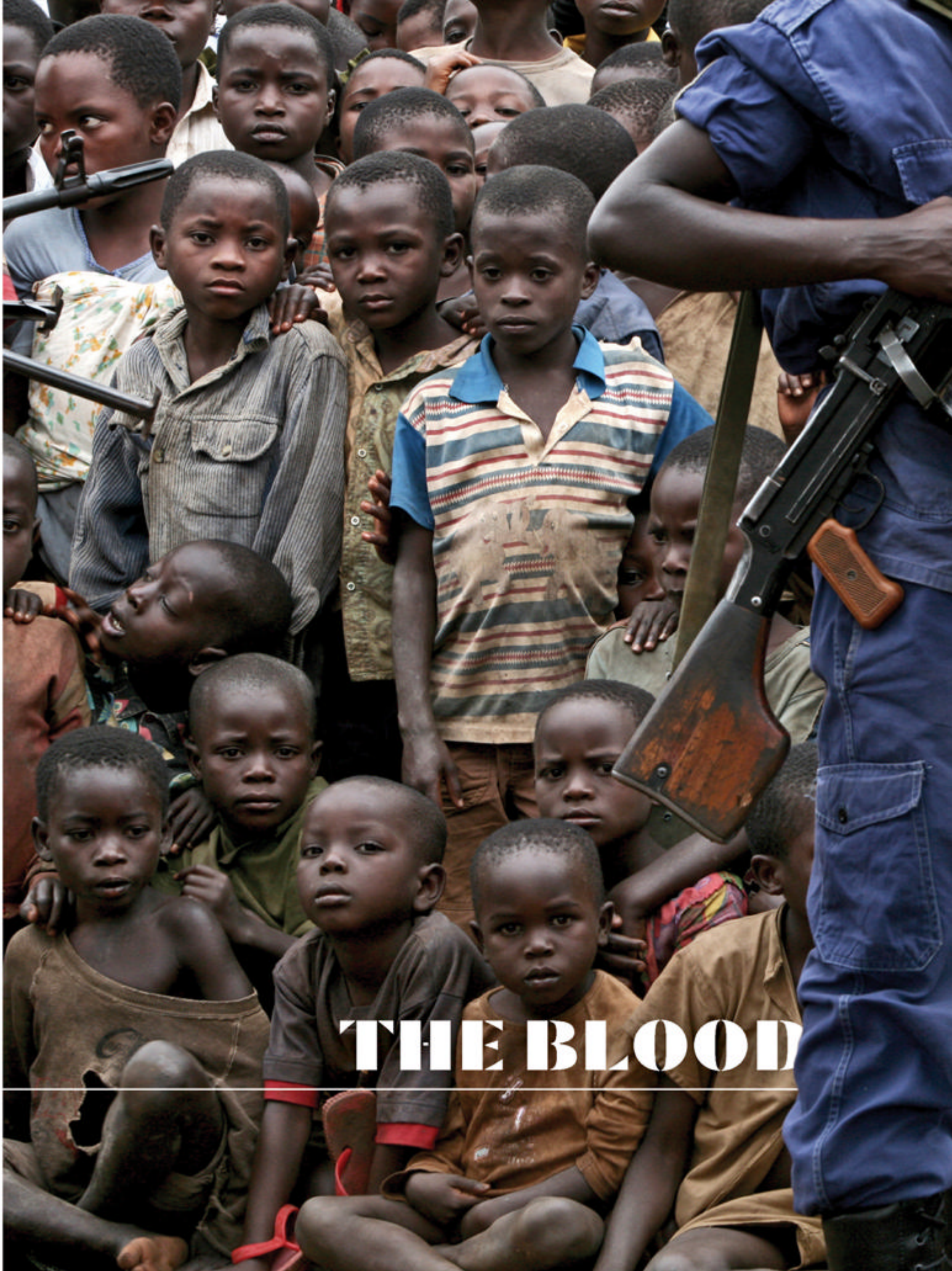
Israel, meanwhile, maintains a stance of nuclear ambiguity—neither confirming nor denying that it has weapons—though it has been widely accepted for decades that the country has an arsenal. In the absence of official information, the news media, think tanks, authors, and analysts have given widely varying appraisals of the size of the Israeli nuclear stockpile, from 75 up to more than 400 warheads. (Kristensen and Norris estimate that Israel has about 80 warheads.) The country is also likely modernizing its land-based ballistic missile and a cruise missile for its submarines.

Although North Korea's nuclear program and bellicose rhetoric have drawn regular media coverage, it is unclear to what extent the country has militarized its nuclear capability. What is clear is that the rhetoric has not diminished. And satellite monitoring and expert consensus suggest that, though the country is not there yet, North Korea is certainly trying to achieve the ability to field deliverable nuclear weapons. It is an understatement to say success could significantly increase tension in the region around the Hermit Kingdom.

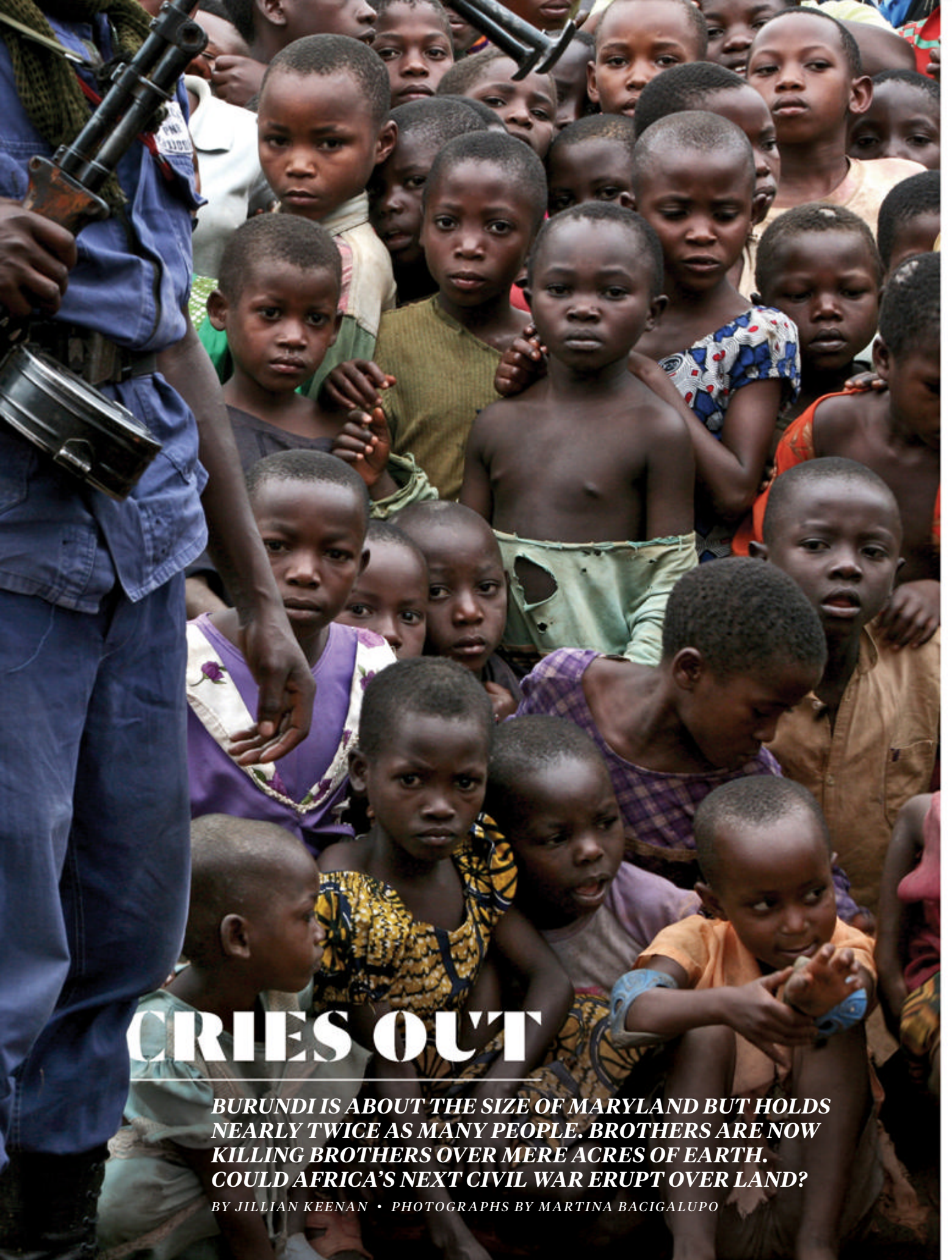
It is a well-worn trope in news articles about disarmament to quote from Obama's stirring April 2009 speech in Prague. "Some argue that the spread of these weapons cannot be stopped," he intoned to a rapt crowd. "Such fatalism is a deadly adversary." The speech provides a dramatic contrast to the general disappointment in his administration's disarmament efforts in the time since it was delivered. But often, a key portion of the speech is conveniently overlooked: Immediately after asserting America's commitment to a nuclear-weapons-free world, Obama warned that such a goal would be difficult and might not be reached in his lifetime. Prague was never a promise of instant disarmament.

Today, however, even the Obama administration's complicated, gradual efforts toward controlling nuclear weapons are being undercut, perhaps even being rendered moot. The nuclear nonproliferation and disarmament regime is centered on the NPT, which entered into force in March 1970, the month when the Beatles released the song "Let It Be" and the Concorde airliner made its first supersonic flight. The decades have certainly added up since then; the Beatles and the Concorde are no more. But the NPT still staggers on, now up against a modernization tide that sees the major nuclear countries continuing to spend enormous fortunes improving their arsenals. Unless the United States, Russia, and other powers find a way to agree on reining in their modernization programs, the world's non-nuclear countries will have increasingly legitimate reasons to ask how they benefit from being part of the NPT—and why they shouldn't go their own way. ■

JOHN MECKLIN (*@meckdevil*) is the editor of the *Bulletin of the Atomic Scientists.*



THE BLOOD



CRIES OUT

BURUNDI IS ABOUT THE SIZE OF MARYLAND BUT HOLDS NEARLY TWICE AS MANY PEOPLE. BROTHERS ARE NOW KILLING BROTHERS OVER MERE ACRES OF EARTH. COULD AFRICA'S NEXT CIVIL WAR ERUPT OVER LAND?

BY JILLIAN KEENAN • PHOTOGRAPHS BY MARTINA BACIGALUPO



Pierre Gahungu was attacked by a relative for refusing to share a portion of his land.

When Pierre Gahungu thinks about the small farm in the Burundian hills where he grew up and started a family, he remembers the soil—rich and red, perfect for growing beans, sweet potatoes, and bananas. He used to bend over and scoop up a handful of the earth just to savor its moist feel. To Gahungu, now in his 70s, the farm was everything: his home, his livelihood, and his hope. After he was gone, he had always believed, the land would sustain his eventual heirs.

But then, in an instant, his dreams were thrown into jeopardy. On a dusky evening in 1984, Gahungu was walking home when he heard a noise behind him. He turned and found himself face to face with Alphonse, the son of a cousin. For months, Alphonse had been begging Gahungu, whom he called "uncle," for a portion of the farm. Alphonse's polygamous father had many sons—more than 20, Gahungu says—which meant each one would get just a tiny plot of his land. (In Burundi, generally only men may inherit property.) Alphonse wanted more space, a rapidly shrinking commodity, on which to build a house and a life. Gahungu had a much smaller family—ultimately, he and his wife would have three children, but only one boy, named Lionel—so he had plenty of land to share, Alphonse reasoned. Why shouldn't he get a piece of it? Gahungu, however, had refused repeatedly. When he saw Alphonse that night on the road, he assumed they were in for another round of the same exhausting refrain.

Alphonse, however, had not come to talk. Without saying a word, he raised a machete and brought it down onto his uncle's skull. Gahungu remembers feeling

a flash of pain and hearing a bone crunch before everything went black.

"I was terrified," Gahungu says through an interpreter. He woke up wounded and later saw a doctor. He began recovering from his injury, but he feared that his farm would never be safe in his hands. Gahungu decided that if Alphonse couldn't kill him, the land's legal owner, his son's inheritance would be safe. So he left his family behind and moved alone to the nearby city of Muramvya, where he worked at a tailoring shop downtown.

Before long, more problems arose, but not with Alphonse (who, Gahungu says, died in a car accident). One of Alphonse's brothers built two houses on Gahungu's land without his uncle's permission. In 1991, on the eve of a brutal, 12-year civil war that pitted Burundi's two main ethnic groups, Hutu and Tutsi, against one another, Gahungu took the man to a local court, which ruled in the owner's favor. But winning the legal battle did nothing to change Gahungu's situation: To this day, he says, Alphonse's brother, the brother's family, and the two houses illegally occupy his farm.

Gahungu has tried to go back to Burundi's backlogged courts for help, but he doesn't have the money to pay for a case. Tragedy, too, has continued to follow him: Lionel died at just 19. As his own life draws toward an inevitable end, Gahungu lives alone in Muramvya. He now fears he will die before ever getting his beloved land back. "It was the perfect farm because it was my farm," Gahungu recalls. "It was my whole life."

Gahungu's experience mirrors other stories familiar to Burundi for decades—stories that are multiplying and worsening as the country copes with a veritable explosion of people. At 10,745 square miles, Burundi is slightly smaller than the U.S. state of Maryland, but it holds nearly twice as many people: about 10 million, according to the U.N. Development Programme, or roughly 40 percent more than a decade ago. The population growth rate is 2.5 percent per year, more than twice the average global pace, and the average Burundian woman has 6.3 children, nearly triple the international fertility rate. Moreover, roughly half a million refugees who fled the country's 1993-2005 civil war or previous ethnic violence had come back as of late 2014. Another 7,000 are expected to arrive this year.

The vast majority of Burundians rely on subsistence farming, but under the weight of a booming population and in the long-standing absence of coherent policies governing land ownership, many people barely have enough earth to sustain themselves. Steve McDonald, who has worked on a reconciliation project in Burundi with the Woodrow Wilson International Center for Scholars, estimates that in 1970 the average farm was probably between nine and 12 acres. Today, that number has shrunk to just over one acre. The consequence is remarkable scarcity: In the 2013 Global Hunger Index, Burundi had the severest hunger and malnourishment rates of all 120 countries ranked. "As the land gets chopped into smaller and smaller pieces," McDonald says, "the pressure intensifies."

This pressure has led many people who want land, like Alphonse years ago, to take matters into their own hands—at times violently. The United Nations estimates that roughly 85 percent of disputes pending in Burundian courts pertain to land. Between 2013 and 2014, incidents of arson and attempted murder related to land conflict rose 19 percent and 36 percent, respectively. Violence sometimes occurs within families, but it also can play out between ethnic groups: Most returning refugees are Hutu, but the land they left behind has often been purchased by Tutsis. "The land issue comes into politics when parties say, 'I promise to return to you what is rightfully yours,'" says Thierry Uwamahoro, a Burundian political analyst based in the Washington, D.C., area.

Against this fragile backdrop, the Institute for Security Studies, a South African-based think tank, has warned that "attempts to politicise land management … risks reigniting ethnic tensions" before national elections scheduled for May and June. Many locals, however, fear that an even bigger disaster is looming. "The next civil war in Burundi will absolutely be over land," says a communications consultant in Bujumbura, the capital, who works for U.N. agencies and asked not to be named for security reasons. "If there is no new land policy, we won't last a decade."

There are no easy solutions to Burundi's mounting land crisis, but stories like Gahungu's offer a glimpse of what might happen if this ticking time bomb is not diffused. "In the past, this situation didn't exist," Gahungu says, standing outside the tailoring shop where he still works, cleaning and ironing clothes. "There was land for all, but not anymore. I fled because I feared that what happened to me before could happen again. It happens to someone every day now."

Before European colonizers arrived in Burundi, farmers cultivated the country's arable hilltops, while less desirable, low-lying swamplands went largely unclaimed. An aristocratic class, known as the Ganwa, technically owned the land, but farmers' access was administered at the local level by a network of "land chiefs," many of whom were Hutu. The chiefs also resolved land conflicts, according to Timothy Longman, director of Boston University's African Studies Center.

Under Belgian rule, which lasted from 1916 to 1962, this all began to change. The king, the head of the Ganwa, kept control of the highlands. (According to scholar Dominik Kohlhagen, the king was seen as the land's spiritual guardian.) But the state assumed ownership of the lowlands and began to encourage their cultivation. The colonial government also concentrated political power among the Tutsi minority, which comprised about 14 percent of the population, giving the group a near monopoly on Burundi's government, military, and economy. Among other actions, this consolidation involved gradually stripping the Hutu land chiefs of their authority. More broadly, too, it sowed the seeds of dangerous ethnic polarization.

Under colonialism, official land deeds and titles were few and far between, which meant that Burundians often could not prove that they owned acreage. In the early 1960s, as independence loomed, the



government began offering land registration to parties that requested it, which, for the most part, were foreign businesses such as hotels. Families also had the option to register their land, but because the centralized system was inaccessible for most farmers and required a huge tax payment, few did. So land plots quickly fell into two categories: those with boundaries recognized by the state, and those with borders determined by custom—that is to say, residents understood trees, rocks, paths, creeks, and huts to mark de facto property lines.

The Catholic Church was among the institutions that benefited from the colonial approach to land. Missionaries, known as "White Fathers," began arriving in the late 19th century, and over several decades, the king gave them large tracts of land, which they used to establish churches, schools, hospitals, and farms. After colonialism ended, the self-sufficiency that land provided the church helped it retain influence, even as its relationship with the newly independent government grew fraught. Most notably, Jean-Baptiste Bagaza, a military leader who in the mid-1970s seized Burundi's presidency in a bloodless coup, saw the church as an extension of colonial power and a rival to his own, so he limited the hours in which congregations could gather, shut down a Catholic radio station, and used visa non-renewals and expulsions to decrease the number of missionaries in the country. Nevertheless, the church retained millions of Burundian followers, along with plenty of land, though no one, it seems, knew exactly how much.

The Catholic Church was also complicit in nurturing Burundi's ethnic divisions; Catholic schools, for instance, were largely reserved for "elite" children, meaning Tutsis. Intensifying schisms led to various outbreaks of ethnic violence, and in 1972, the Tutsi-dominated military launched a series of pogroms targeting Hutus. More than 300,000 Hutus fled the country in under a year, leaving behind their land. Bujumbura took advantage of some of this newly vacated property and extended agricultural schemes called *paysannats* (derived from the French word for "peasantry"): The state leased the land to farmers, who would grow cotton, tobacco, and coffee and then sell these crops back to the government, the only legal buyer. Officials in Bujumbura hoped to boost Burundi's weak economy by reselling the crops on the international market.

Most Burundians rely on subsistence farming, yet many barely have enough land to sustain themselves. Today, the average farm is just over one acre.

But the paysannat system failed miserably due to corruption, inefficient government bureaucracy, and variations in global commodity prices. Seeking bigger profits than they were able to get in Burundi, farmers began to smuggle their harvests over the country's borders, and state-run agricultural buying programs floundered in the mid-1980s. Paysannats also ignored and often destroyed the physical markers that had defined traditional land boundaries. Along with the pervasive lack of legal documents showing land ownership, this made it impossible for most returning refugees to reclaim their lost acreage. (Today, the Hutus who left in 1972, some of whom have never come home or are only just doing so, are called "old-caseload" refugees.)

The government set up two commissions, in 1977 and 1991, to resolve land disputes, but they proved largely ineffective. Ethnic tensions continued to mount, coming to a head in 1993. That October, Tutsi extremists assassinated Burundi's first democratically



elected Hutu president, Melchior Ndadaye, and civil war erupted as Hutu peasants responded by murdering Tutsis. In just the first year of conflict, tens of thousands of people were killed; by the time the war ended more than a decade later, some 300,000 Burundians, most of them civilians, had died. The war also produced a new wave of roughly 687,000 refugees.

When the dust settled, the effects of mass death and displacement were exacerbated by widespread poverty, food insecurity, and a host of other post-conflict challenges, all of which persist today. In 2014, the World Bank estimated Burundi's GDP growth rate at 4.0 percent, below the average of 4.5 percent for countries in sub-Saharan Africa. The bank forecasts that this gap will only widen in 2015, with Burundi's rate declining to 3.7 percent and the region's climbing slightly. The issue of land, meanwhile, has become a casualty in its own right, thrown into greater flux than ever before.

Today, there are dozens of scenarios under which people claim land, and the same plot, no matter how tiny, is often the subject of competing claims. Some families still say they own acreage because of paysannat leases; seeking to make a profit, tenants have even sold their land over the years, despite the fact that it is technically state-owned. According to the International Crisis Group, some 95 percent of Burundian land still falls under customary law: A family says it purchased its farm from neighbors before the war, but holds no formal deed, while another claims village elders approved the purchase of a few acres after the war, and so on. A centralized registration system does exist, and according to the country's land code (which was revised in 2011 for the first time since 1986), any person who owns property must hold a land certificate. The bureaucratic system, however, is complicated, and the government has done little in terms of enforcement. According to Kohlhagen, offices that issue certificates exist in only three cities, and as of 2008, only about 1 percent of the country's surface area was registered.

Complicating matters further is the continuous flow of refugees who return home to find their land occupied by new owners.

In some cases, a Hutu farmer who fled the 1972 pogroms may come back to find two other people claiming his property: whoever lived on it up until 1993, and whoever claimed it after the civil war. The last resident may have purchased the land legally, even from the government itself, and may have been paying off mortgages for decades. The question then becomes, who should get to live on the land now—and how should the claimants who can't have it be compensated?

The government has no clear answer. "It's tricky to say what land policy is today, because there is not a uniform dispute-resolution strategy," says Mike Jobbins, a senior program manager at Search for Common Ground, a conflict-prevention NGO that works in Burundi. "Every case is decided on its own merits."

The Burundian courts and *bashingantahe*, or traditional panels comprising senior men in villages, are empowered to settle land disputes. But while courts issue legally binding rulings, cases are time-consuming and often prohibitively expensive. The bashingantahe, meanwhile, are free, yet operate according to customary law. A third body would seem to offer a more promising option: The National Commission for Land and Property, known by its French acronym, CNTB, was established in 2006 to resolve arguments over who owns land vacated by refugees. Its 50 members are required to be 60 percent Hutu and 40 percent Tutsi, and since its creation, the CNTB has processed nearly 40,000 cases.

But the CNTB has struggled to adopt a consistent approach to its judgments. At first, its preference was to divide land between valid claimants, both past and current owners. Since 2011, however, it has begun returning land to its original owners, usually Hutu refugees displaced in 1972. In some cases, it has even revised decisions on previously closed disputes. This has led to angry claims that the government of President Pierre Nkurunziza, a Hutu, is trying to curry support from Burundi's predominantly Hutu electorate.

The government did nothing to quiet these concerns when, in December 2013, it expanded the CNTB's mandate to review cases that predate even 1972, made it a criminal offense to obstruct the commission's actions, and allowed rulings to be appealed to a new "land court" that can issue binding decisions. This move to boost the CNTB's power created suspicion among critics of the government that the commission's biases would only become more firmly entrenched. "Far from uniting Burundians or reconciling them, this new law on the CNTB will divide them," Charles Nditije, then leader of an opposition political party, told the media at the time.

Other criticisms surround the government's failure to establish a compensation fund for people who do not win land disputes. The 2000 Arusha Peace and Reconciliation Agreement for Burundi, which outlined a plan for the country's postwar

●

Pastor André Florian sits in front of his church in Kayanza province.

●

A group of people in Bujumbura assemble in front of the Office of the Ombudsman. They have come almost every day for nearly a year in order to solve the conflict they have with the government over their land.





peace process, guaranteed compensation, but according to Thierry Vircoulon, the International Crisis Group's project director for central Africa, the state seems to have "completely ignored" this detail. Some government detractors say this is a deliberate, ethnically driven decision by Nkurunziza's administration, because many people eligible for compensation would be Tutsi.

Murky, controversial land policies have at times led to interethnic violence. In 2013, riots broke out in Bujumbura when the police tried to evict a Tutsi family from the house it had owned for 40 years in order to give the house back to its previous Hutu residents. "We are here to oppose injustice, to oppose the CNTB, which is undermining reconciliation in Burundi society," a protester was quoted by Agence France-Presse as shouting. Over a six-hour standoff, more than a dozen people were reportedly hurt, and 20 were arrested.

Ethnic tensions, however, are only part of the puzzle in Burundi's land crisis. Poor farming families are straining the country's limited ground space. About two-thirds of Burundians live in poverty, and families often have several male heirs who are forced to share plots of earth that barely fit a home and a few rows of crops. As a result, according to research conducted by land-rights consultant Kelsey Jones-Casey, "[T]he most destructive conflicts experienced by rural people in Burundi are intra-family disputes, most of which manifest over the issue of inheritance." Violence sometimes occurs within polygamous families, with sons born by different mothers fighting for finite land. In Muramvya, people speak in low voices about a woman who slit her husband's throat to accelerate a land inheritance for her son.

Violence over land is roiling a country that already clings to an uneasy peace. Nkurunziza's government has been accused of ordering convictions, murders, and disappearances of political adversaries, among other abuses. In January, the state claimed to have killed nearly 100 rebels who had crossed the border between Burundi and the Democratic Republic of the Congo with the intention of destabilizing the country and the upcoming national elections, in which Nkurunziza is expected to seek a third term despite a constitutional limit of two. Vital Nshimirimana of the Forum for the Strengthening of Civil Society in Burundi told Voice of America that officials had suggested the country's political opposition supported the rebels: "This is what leads us to think that it might be a fake explanation to actually take advantage of the same to arrest opposition leaders or some civil society [members]," he said. A few days later, youth leader Patrick Nkurunziza (no relation to the president) was arrested for his alleged connections to the rebels; at the same time, the government sentenced opposition leader and former Vice President Frédéric Bamvuginyumvira to five years in prison for bribery.

Violence over land is roiling a country that already clings to an uneasy peace.

Many Burundians fear that land could be the detail that pushes swelling political tension into something far worse. "Land is the blood and the flesh of any human being," says Placide Hakizimana, a judge in Muramvya, who notes that 80 percent of the cases he adjudicates pertain to property disputes. "Without land, we are condemned to death. No one will accept that. [Families] will fight. We prefer to die rather than live without land."

Policy reform may be a dead end

or, at least, one that is too rife with corruption and partisan battles to ever solve the land crisis. This thinking is driving some people to focus on restricting population growth. "Family planning is the only exit point to the land problem," says Norbert Ndihokubwayo, a member of Burundi's parliament and president of a legislative commission on social and health issues. "No other solution is possible."

In 2011, the government approved a national development strategy called "Vision Burundi 2025" with ambitious demographic goals: to reduce national growth from its current rate, which would cause the population to double every 28 years, to 2 percent over the next decade, and to slash the birthrate in half. To hit these numbers, the government said it would partner with civil society to "stress … information and education on family planning and reproductive health." Ndihokubwayo says the government is also "absolutely" considering a law that would limit the number of children each family can have.

Many international donors are helping to expand access to family-planning services. The Netherlands chose Burundi in 2011 as one of 15 "partner countries" in which to emphasize programs that promote peace and stability, and according to Jolke Oppewal, the Dutch ambassador to Burundi, his country now donates 8 million euros annually to programs promoting sexual and reproductive health, among other human rights. In a 2005-2013 contract, the German government-owned development bank KfW dedicated more than 1.4 million euros to "strengthening and reorganizing [Burundi's] reproductive health and family planning services."

Some medical professionals are keenly aware of the role they are meant to play in keeping population growth in check. Christine Nimbona is a nurse at a secondary health clinic in Kayanza province, which, with nearly 1,500 inhabitants per square mile, is one of Burundi's most overpopulated regions. One day in August, several women waiting outside the clinic where Nimbona works nursed babies; dozens of children played nearby. Nimbona says that of the roughly 30 patients she sees each week, "almost all" cite fears about land resources and potential inheritance conflicts as their reasons for seeking family planning. "I know that by what I am doing, I am fighting the escalation of violence in my country," Nimbona says.



It's an uphill battle, littered with enormous, deep-seated obstacles. According to the United Nations, modern contraceptive use among females between the ages of 15 and 49 was just 18.9 percent in 2010. In Burundi's male-dominated society, women are often powerless to convince their husbands to use birth control. Then there is the Catholic Church: In addition to claiming an estimated 60 percent of Burundians as followers, the church has affiliations with roughly 30 percent of national health clinics, which are forbidden from distributing or discussing condoms, the pill, and other medical contraceptives. "Catholic teachings against birth control are very resonant with Burundian culture, which says that children are wealth," explains Longman, of Boston University. "Because the Catholic Church is so powerful and controls so much of the health sector, it creates a huge stumbling block for family-planning practice."

Bujumbura insists that the Catholic Church is a collaborative partner on land issues. The president even appointed a Catholic bishop, Sérapion Bambonanire, as head of the CNTB in 2011. But cracks do exist between church and state. In 2012, the Ministry of Public Health launched a series of "secondary health posts," which offer medical contraceptives; sometimes these clinics, including Nimbona's, are built right next door to existing Catholic ones.

There is also tension over a variable with unknown dimensions: how much of the land the Catholic Church held onto after colonialism it still owns today. "The Catholic Church can't keep owning all the land while Christians are starving," says a regional government employee in Kayanza, who spoke on condition of anonymity out of concern for his safety. According to him, in 2013 the government quietly launched a mapping program to determine, among other things, how much land the church controls. "National politics don't allow us to focus on the Catholic Church," he says, referring to the fact that the church's followers are also voters. "So the government thinks this indirect method is best."

Ndihokubwayo says a land-mapping program does exist, but won't confirm or deny whether it was created specifically to find out how much property the Catholic Church possesses. "This is a very delicate issue," he explains. "I'm not sure whether we'll ever find out how much land the church owns, but we'll keep trying." (Cara Jones, an assistant professor at Mary Baldwin College who studies Burundi, pointed out that the program would also give President Nkurunziza's ruling party information about how much land its political opponents own.)

Some religious leaders are on board with the push for family planning. Pastor André Florian, a priest in Burundi's Anglican Church, which has an estimated 900,000 followers, says he used to be part of the problem. From the pulpit of his small stone church in Kayanza, he once railed against the evils of contraception. Family planning, he told his congregation, was best left to God. Yet Florian watched with grave concern as members of his flock struggled to feed their babies. One day, he looked at a child with dull orange hair, a clear sign of advanced malnutrition, and asked himself: Was this really God's plan? Shaken, Florian isolated himself for three months, studying scripture and praying. "When I returned from my research, I realized that I had done wrong," Florian says. "If nothing happens, if we just keep doing what we're doing, tomorrow is not certain. We will see families killing each other. We will see chaos in the country. The day after tomorrow will disappear."

Other Burundians, however, fear that support for family planning is too little too late. Joaquim Sinzobatohana, a father of four in Ngozi province, says he first learned about vasectomies on a radio program. (Eighty percent of Burundians have a radio, and U.N.-funded songs and soap operas now dramatize stories of families that have suffered

● **In an attempt to emphasize borders, some Burundians build walls around their plots of land.**

● **Students squeeze into a classroom in Kayanza, one of the country's most overpopulated provinces.**





the burden of many pregnancies but are saved by family planning.) He decided to get the operation, a simple outpatient procedure, because he and his wife, Clautilde, are "very scared" that their small plot will provoke conflict among their children, and more offspring would only increase the chances of violence. But Sinzobatohana admits that even a demographic freeze might not save his family, or his neighbors. The numbers just don't add up: Already, too many people are squeezed onto too little land.

"It's unfortunate that these contraceptive programs came after we already had too many kids," Sinzobatohana says. "The damage has been done. Now we wait."

International experts say a comprehensive approach to Burundi's land crisis is necessary—one that combines policy reform, better dispute-resolution options, family planning, and new economic opportunities that will ensure fewer Burundians rely solely on the earth for survival. "People need to have economic opportunities besides agriculture, to incorporate people into other kinds of jobs and trades, so that not everyone is dependent on farming for their livelihoods," says Jobbins of Search for Common Ground. "Without some prospect for economic growth within the context of the region and the East African community, land scarcity will continue to be a stressor."

But the land problem is infinitely complex, with roots that run deep into Burundi's history. The resources and political will to deal with it are scarce. And whether in a new law or a family's decades-long story, there will always be critical details that go overlooked—details that could become matters of life and death.

In 1999, Emmanuel Hatungimana, an elderly farmer in northern Ngozi, could feel his body slipping away. Death was very close. So he gathered his family—two wives and 14 children—around his bedside. It was time to divide his farm.

At 37.5 acres, Hatungimana's lush plot of land was a decent size. An equitable division would have left his eight sons with roughly 4.7 acres each. The eldest sons of Hatungimana's two wives stepped up to represent his part of the family: Pascal Hatungimana for the four sons of the first wife, and Prudence Ndikuryayo for the four sons of the second wife. Hatungimana gave exactly half of his land to Pascal and his brothers, and the other half to Prudence and his brothers. The patriarch was satisfied, according to Pascal; his family's future was secure. A few days later, he died at peace.

But no one had considered the road.

One side of Hatungimana's land runs alongside a paved road, a very desirable quality because access to that lane makes it significantly easier to bring supplies in and out of the property. In dividing his land right down the middle, however, Hatungimana had ensured that only four of his sons could claim the road as a border.

Today, more than 15 years after Hatungimana's death, his family teeters on the brink of violence. Prudence says it's unfair that Pascal and his brothers have the better land, and that he is willing to fight to get what he deserves. But Pascal doesn't want to give up anything. So they've brought their case to a local bashingantahe. If the panel can't resolve the dispute, both brothers say they don't know what will happen.

Standing on the land outside his brother's house, Prudence looks left, over his shoulder, at Pascal, who listens nearby with his arms crossed. A dark expression falls over Prudence's face. "Around Burundi, brothers are killing brothers. Sons are killing fathers. And it's all for land," he says. "Hopefully our family won't reach that stage. But if something doesn't happen, everything will fall apart." ■

JILLIAN KEENAN (*@JillianKeenan*) is a writer based in New York. She is working on a book about Shakespeare and global sexuality. A grant from the United Nations Population Fund supported research for this article.

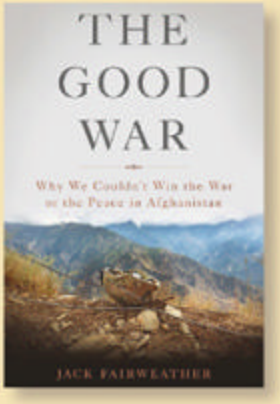
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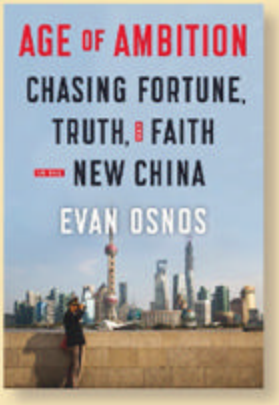
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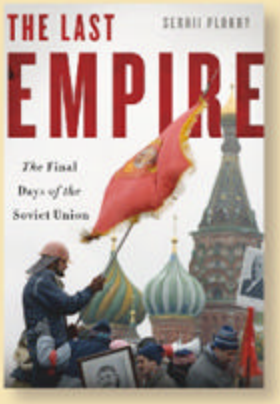
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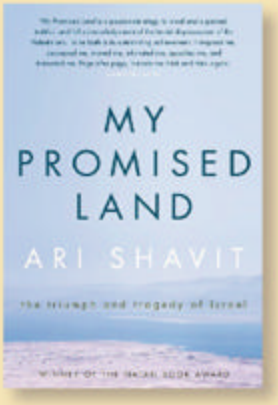
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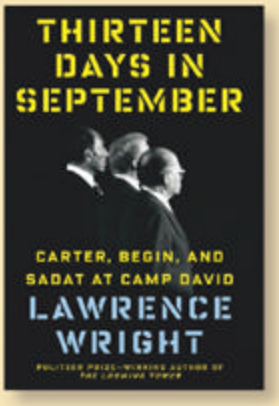
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Alfred A. Knopf

Like a mystery, filmed on a mountain called Camp David—Carter, Begin, and Sadat effectively incarcerated by public expectations where human foibles, resentments, greed, and ambition play out in a compromise that barely survives the travels home from the set.

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Illustration by ANDY REMENTER

by DAVID ROTHKOPF

Tehran Trigger

Is the possibility of a nuclear Iran a threat, a distraction, or both?



Once upon a time, no term evoked modernity like "the Atomic Age." It contained the promise of harnessing the power of the atom for good and for ill. Unleashing the secrets of the atom was what separated the world's most advanced and powerful nations from the rest.

This Damoclean era was ushered in 70 years ago, on July 16, 1945, with the Trinity nuclear test in New Mexico's Jornada del Muerto desert. The name translates to "Dead Man's Journey"—fitting, because the detonation triggered a nuclear arms race that made palpable the dark threat of planetary Armageddon. As is the case with others who grew up in the 1960s, some of my most acute, enduring memories are of a childhood shaped by nuclear fears. I was 6 years old during the Cuban missile crisis and remember going to bed at night unsettled by the air-raid drills we rehearsed at school and by the worry I saw in my parents eyes as they watched the evening news. A next-door neighbor built a fallout shelter, and I remember being deeply disturbed by my parents' speculation that we wouldn't be invited into it, in the event of a disaster, because we were Jewish. Seeing civil-defense posters and sirens atop telephone poles left me daily with a knot in my stomach. The famous Lyndon B. Johnson campaign ad suggesting that electing Barry Goldwater would bring America closer to nuclear war—the one in which a little girl plays in the flowers, oblivious to the imminent bloom of a mushroom cloud—was politically effective because it captured the gestalt of the era so perfectly. It only ran once, but it lingered in many people's minds for years to come.

Illustration by MATTHEW HOLLISTER

ident Barack Obama during a speech in Prague that he would make the elimination of nukes a central goal of his administration. And few things have dominated 2015 thus far like efforts to keep Iran from acquiring the bomb.

The debate around Iran, in particular, reveals much about the current phase of the nuclear age, underscoring that lofty ambitions, such as those Obama sketched out in Prague, are nowhere near realization and may never be. Although deterrence still works in certain circumstances—India and Pakistan have avoided major conflict, for instance, and Israel's neighbors are less

IRAN REVEALS MUCH ABOUT THE CURRENT PHASE OF THE NUCLEAR AGE, UNDERSCORING THAT LOFTY AMBITIONS, SUCH AS THOSE OBAMA SKETCHED OUT IN PRAGUE, ARE NOWHERE NEAR REALIZATION AND MAY NEVER BE.

Decades of the Cold War kept these anxieties alive but also somehow allayed them. Deterrence, it turned out, worked. The United States and the Soviet Union never embarked on World War III because the cost of a potential conflict was so high. Fear kept the peace, a perverse bargain. When push came to shove it was in proxy wars. But even then, the prospect of nuclear escalation created an incentive to maintain conflicts within limits and to seek solutions to disputes that threatened to get out of hand.

With the end of the Cold War, there was hope that the world might consign such bleak strategies to history and negotiate away its weapons. But instead, a different reality has emerged. Nuclear issues remain as urgent as ever. In the past few years, the world has been shaken by the Fukushima disaster, disturbed by nuclear saber rattling in North Korea, unnerved by weapons security in Pakistan, and stirred by the promise of a then-new U.S. President Barack Obama during a speech in Prague that he would make the elimination of nukes a central goal of his administration. And few things have dominated 2015 thus far like efforts to keep Iran from acquiring the bomb.

The debate around Iran, in particular, reveals much about the current phase of the nuclear age, underscoring that lofty ambitions, such as those Obama sketched out in Prague, are nowhere near realization and may never be. Although deterrence still works in certain circumstances—India and Pakistan have avoided major conflict, for instance, and Israel's neighbors are less inclined to attack it—a new set of problems has emerged. Ukraine illustrates one of them. If a nuclear power is willing to be bolder than another, it can take limited, conventional actions without fear of major pushback. In other words, Russia, a struggling shadow of a former superpower, can maintain influence in its near abroad that would be impossible were it not for Moscow's nuclear arsenal.

But there is also the threat of a country breaking out from the Nuclear Non-Proliferation Treaty (NPT), which attempts to keep weapons in the hands of the original five nuclear nations (the United States, Britain, China, Russia, and France). Aspirant nuclear powers, such as North Korea, have found that ignoring this international treaty can pay off: Being willing, or seen as willing, to flaunt such agreements grants negotiating leverage. As former U.S. President Bill Clinton said—in an era when the West regularly cut deals by offering aid to North Korea in order to forestall Pyongyang's bomb-building efforts—"North Korea is a country whose cash crop has been missiles and weapons." But, of course, the Hermit Kingdom's regime also learned another important lesson: Once a country has nuclear weapons, there is very little the rest of the world can do about it. (The greatest flaw in the NPT is that it lacks any effective enforcement mechanism against violators.) Thus, Kim Jong Un's government, like those of Pakistan, India, and Israel, arguably has gained influence from having an arsenal.

While Iran's foray toward joining the nuclear club undoubtedly has been inspired by these other countries' experiences, it is a special case, full of apparent contradictions. On the one hand, some national security experts argue that a nuclear Iran would be contained by nuclear forces—the United States and Israel—poised to deliver deathblows within minutes of a first strike. In other words, any nuclear action by Tehran would be suicidal.

On the other hand, many observers worry that a nuclear Iran could take the world to a proliferation tipping point. Given the tensions and rivalries in the Middle East, Iran getting the bomb might trigger an arms race in the region. And with each new player in the nuclear game, risks mount that weapons will fall into the wrong hands, perhaps those of terrorists. The Middle East is the kind of place where roiling instability could open the door to nuclear miscalculations or misadventures, and the notion of a suicide-embracing terrorist group having any sort of nuclear capability is especially chilling. Put simply, a nuclear Tehran could fundamentally alter the calculus of the nuclear

CONTINUED ON PAGE 83

by DEBORA L. SPAR

The Almighty Ruble

Vladimir Putin is just the latest in a long line of national leaders with a sentimental, ill-fated attachment to their countries' currencies.



One can almost excuse Vladimir Putin for trying so hard. This is a man, after all, who famously built his public image in part on feats of derring-do: riding shirtless across Siberia, hang-gliding with migrating birds, and releasing a caged leopard into a natural reserve. So perhaps it isn't surprising that the Russian president would leap with similar brashness into his country's economic crisis, precipitated by tumbling global oil prices and Western sanctions. Why not use sheer financial force to wrestle the depreciating ruble back to safety?

At 1 a.m. Moscow time on Dec. 16, Russia's central bank announced a massive hike in the country's interest rate, from 10.5 to 17 percent. Early indicators of the government's move were mildly positive, with the ruble opening the next morning up 10 percent against the dollar. Within hours, though, the weight of the foreign exchange market reasserted itself, hammering the ruble to less than half its starting value in 2014 and raising the dual specters of inflation and recession. Over the following weeks, Putin and his lieutenants proved almost wholly incapable of controlling the two economic forces that mattered most to them: As of mid-January, spot prices for Brent European crude oil hovered near the historically low level of $46 a barrel, and the ruble was stubbornly slumped at 65 to the dollar.

It's clear why falling oil prices and a declining ruble would strike fear into even the leopard-friendly Putin. The Russian economy remains overwhelmingly dependent on oil and natural gas, which in 2013 accounted for 68 percent of the country's export revenues

Illustration by MATTHEW HOLLISTER

and 50 percent of its federal budget. Diminishing global energy prices could lead to a 4.5 percent GDP contraction in 2015, according to the country's central bank. A declining ruble would similarly wallop the country's holders of hard-currency debt, $130 billion of which come due this year.

What's *not* clear is how Putin and his colleagues could realistically have expected to achieve anything by hiking the interest rate. Unless the increase was intended to attract foreign capital—a very unlikely event—it could only have led to higher inflation and greater downward pressure on the ruble. The country's international debt was destined to become harder to service; the prices of imported goods were likely to rise; and Russian holders of foreign debt were going to face difficulties in accessing foreign currencies.

Yet Putin is hardly the first national leader to chase a stronger currency at the risk of a weaker economy. In the 1920s, Winston Churchill drew down his country's reserve holdings to bolster the British pound, long after the nexus of global financial power had shifted from Britain to the United States. The result was a marked decline in British industrial competitiveness and a sagging economy that contributed to the unfurling of the Great Depression. Half a century later, U.S. President Richard Nixon struggled to maintain the dollar's position as the world's reserve currency despite the growing financial cost to the United States of doing so. And Mexican President José López Portillo pledged to "defend the peso like a dog" shortly before being forced by his country's collapsing economy to let the currency float, and plunge. In all these cases and many others like them (Russia in 1998, Indonesia in 1997, the United Kingdom in 1992), intervention led solely and inevitably to malaise: higher inflation rates, slower growth, rising unemployment, and capital flight.

LEADERS OFTEN ASSOCIATE STRONG CURRENCIES WITH NATIONAL STRENGTH AND THUS VIEW DECLINING CURRENCIES AS INSULTS TO THEIR PROWESS.

Why such a long line of clearly ill-fated policies? Probably because, like many of their citizens, national leaders often seem to feel a physical, sentimental attachment to their currencies. It's an odd vestige, arguably, in a world marked by increasing cross-border flows of foreign exchange, but a powerful one nonetheless. In theory, the value of any currency is an impersonal, apolitical fact—the result of supply and demand in the open marketplace. In practice, though, leaders often associate strong currencies with national strength more generally and thus view declining currencies (and particularly rapidly declining ones) as insults to their prowess.

As a result, in the optics of intervention, a national leader is seeking to convey a certain element of power-broking—to display muscle and an implicit promise that the state is not being abandoned to ruinous outside forces. Think again of Churchill, who in 1925 risked Britain's gold to prop up the beloved pound. The economic wisdom was clear: Intervention would not work. That same year, economist John Maynard Keynes had warned that returning Britain to the gold standard at an artificially inflated rate would lead inevitably to unemployment, class conflict, and prolonged strikes. Yet Churchill proceeded, unwilling to let the pound fall below what he considered its rightful level.

For Putin, too, sitting by as the ruble declined was probably never an option—and still isn't. He likely will keep indulging in efforts to pump up the ruble and draw down Russia's hard-currency reserves accordingly. (In a surprise move, the central bank cut interest rates in late January—but only by 2 percentage points.) Because neither of these measures will do anything to redress the country's underlying economic woes, however, Russia will probably be consigned to muddling through until global oil prices eventually rise again.

What Russia should do is diversify its economy away from anything that involves extracting resources out of the ground and selling them at volatile, internationally set prices. The country should follow the Norwegian example of isolating energy revenues in a sovereign wealth fund, investing the proceeds for the long term, and insulating its broader economy from dependence on commodity markets. It should consider strategies like those employed in Chile, where copper revenues are carefully invested in a broader range of industries and where export earnings during booms are reliably saved for less felicitous days.

Until that happens, Russia and its chest-thumping leader will be caught in a cage of their own making, acting symbolically but without any real effect. And the country will remain on the long list of states making policies based on nostalgia rather than sense. ■

DEBORA L. SPAR (*@deboraspar*) is a columnist for FOREIGN POLICY, the president of Barnard College, and the author, most recently, of *Wonder Women: Sex, Power, and the Quest for Perfection*.

by KEITH JOHNSON

China's Thirst

Oil is transforming the country's foreign policy. Can the United States handle the consequences?



For much of its history, China has made a point of steering clear of other countries' internal affairs. But that changed late last year, when the Middle Kingdom entered into the international arena in a way it hadn't before, offering both money and military might to fight the terrors of the Islamic State. More than China's typical muscle flexing, these actions—like much of the country's foreign policy in the past decade—can be traced back to a growing trend: an urgent and gluttonous appetite for imported energy, specifically oil.

This raises one of the big, looming questions that will help define relations between Washington and Beijing in the decades to come: As the shape of China's energy addiction starts to resemble that of the United States, will China's global role follow suit?

In just a single generation, thanks to unprecedented economic growth, China went from being self-sufficient in crude oil (producing what it consumed) to nearly displacing the United States as the fuel's biggest importer. In 2014, China imported about 6.2 million barrels per day on average, while the United States took in roughly 7.4 million. In December, Chinese oil imports topped 7 million barrels a day for the first time, while U.S. crude production continued to increase to more than 9 million barrels a day, virtually as high as it has ever been.

Where and how China gets all that oil has become a headache for the country's leadership, now experiencing many of the same problems that have bedeviled U.S. presidents since Richard Nixon. Beijing is learning the lesson of OPEC's 1973-1974 oil embargo—that steady supplies of oil, especially from the Middle East, are critical for steady economic growth. China now imports about 60 percent of its oil, and the list of key suppliers includes some of the world's most volatile countries: Iran and Iraq and, outside the Middle East, Sudan and Venezuela. All these states have had oil output disrupted by violence, terrorism, dysfunction, or international sanctions.

This increasing reliance on unstable countries has spurred

Illustration by MATTHEW HOLLISTER

China to undertake its first-ever overseas deployment of combat forces in a peacekeeping role—in Africa, where China has long been involved in investment, infrastructure, and agriculture programs. In 2013, Beijing sent 170 troops to Mali to help prevent the country's tumult from spilling into its oil-rich neighbors, such as Algeria and Libya. A year later, in another first, China leaped into peace talks between warring factions in South Sudan.

But securing oil production isn't China's only worry; shipping, of course, is also a key concern. More than 80 percent of Beijing's imported oil has to wind its way through a global choke point, the Strait of Malacca—a channel near Singapore that shrinks to less than two miles wide and handles more than 15 million barrels of oil shipments a day. In a 2003 speech, Hu Jintao, then China's president, articulated the "Malacca dilemma": the fear that "certain major powers"—code for the United States—could cut China's energy lifeline in this narrow passage, mirroring what America did to Japan during World War II. In turn, Hu accelerated a naval modernization program, which has continued under President Xi Jinping, with the launch of China's first aircraft carrier, the introduction of its first anti-ship ballistic missile, and a tripling of its destroyers, frigates, and attack submarines. Some of this progress has been on display since 2008, when China deployed long-term anti-piracy patrols in the sea lanes off the coast of Somalia and in the Gulf of Aden—its first overseas naval mission in 600 years. And in a step intended to eliminate its seaborne vulnerabilities, China opened a gas and oil pipeline across Myanmar in late January 2015.

China's new oil-fueled engagements saw a definitive shift toward the Middle East when, in November 2014, Beijing offered Washington money (some $10 million) to aid displaced persons in Iraq. A month later, it offered Iraq military support in the form of airstrikes for combating the Islamic State. Coming from a country that has long viewed U.S. military interventions as the sharp end of nefarious Western plots, these offers were startling. But they were in line with open discussions by top officials, including Foreign Minister Wang Yi, about an increasingly prominent Chinese role in the region. As a case in point, Beijing's new Middle East envoy is an expert in Israeli-Palestinian peace talks—a sign that China is preparing for full-bore involvement in one of the Middle East's most intractable issues.

AS CHINA GETS BIG ENOUGH TO PULL ITS OWN WEIGHT, IT WILL ALSO GET BIG ENOUGH TO ACTUALLY THROW IT AROUND.

The change in China's foreign policy comes just as the United States is trying to detangle itself from a decade of troubled wars. A full withdrawal from the Middle East will be impossible, given the eruption of the Islamic State and a long-standing promise to protect energy supplies for America's allies. Consequently, the United States will need to figure out how to work with a confident China—not just in Washington's pivot to Asia, but in Beijing's pivot to the west.

In a way, Washington has been asking for this. U.S. officials have long pushed China to pull its weight internationally; President Barack Obama complains that China has been a "free rider" for decades, benefiting immensely from global trade and energy flows made possible by the U.S. Navy. In that sense, Chinese peacekeepers in Africa and China's anti-piracy patrols have been welcomed as a sign that Beijing is becoming, in the words of former Deputy Secretary of State Robert Zoellick, a "responsible stakeholder" in the international system.

But there is an important and potentially dangerous flip side, particularly in the Middle East: As China gets big enough to pull its own weight, it will also get big enough to actually throw it around. This reality is already becoming apparent in China's backyard, where air-defense zones and bristling gunboats are helping Beijing push territorial claims against smaller neighbors. Where the Chinese military feels comfortable operating—in the South China Sea, for instance—it has repeatedly and recklessly challenged U.S. aircraft and surface vessels. One fear for Washington is that this behavior will reach the Middle East. The last thing the United States wants to see is its freedom to maneuver in the region curtailed by an active and capable China.

Granted, that's not going to happen overnight. Unlike the United States, China doesn't have formal alliances in the Middle East or air and naval bases nearby—not yet, anyway. And despite recent advances, the Chinese navy is still decades away from matching U.S. firepower. But that doesn't mean that China will cede the playing field. It still has plenty of leverage: economic influence, a no-strings-attached approach to aid and investment, and an increasingly proactive diplomatic corps backed by strong leadership. The United States may not have to confront a Chinese carrier-strike group in the Persian Gulf just yet, but it still needs to prepare for cohabitation or collision—or both. ■

KEITH JOHNSON (*@KFJ_FP*) covers the geopolitics of energy for FOREIGN POLICY.

by JAMES BAMFORD

Blocking Inspiration

The United Kingdom and Australia hope to squash AQAP's slick online magazine with extreme censorship laws. Could the United States be next?

In pictures, Nicholas Teausant is thin and gaunt, with large black-rimmed glasses and a short, scrawny patch of hair on his face that is more of a furry chin strap than a beard. For two years, he was a member of the National Guard and also a student at San Joaquin Delta College. But his future, ultimately, wasn't to be found in either school or government duties. A single father who lived with his mother in Acampo, California, a tiny Central Valley hamlet of 341 people, Teausant wanted to become a terrorist.

His radicalization began a few years ago. Around the spring of 2013, he considered becoming a "lone wolf" terrorist after reading a letter written by Omar Abdel Rahman in *Inspire*, an English-language magazine published online by al Qaeda in the Arabian Peninsula (AQAP).Produced about three times a year, *Inspire* is snarky and slick; it models itself on glossy American magazines.

Inspire offers how-to guides for building bombs and staging terrorist attacks, and it gives space to famous voices in the global jihadi movement, including the Blind Sheikh, as Abdel Rahman is known. (He was convicted in 1995 for planning to bomb U.S. targets, including the U.N. headquarters and the Holland Tunnel.) In his letter in *Inspire*, Abdel Rahman outlined terrible conditions at the federal supermax prison in Florence, Colorado, where he was being held at the time; he wrote that he was placed in isolation and also speculated that people were trying to poison him. According to a federal criminal complaint, the article prompted Teausant to send a text message to a friend. "[W]e HAVE TO DO SOMETHING NOW!" he wrote. "I want this to end someone or something needs to happen. I'll do anything possible. We need to plan In [*sic*] person and get together and I'll do the acting I'll be the pawn."

It wasn't the only time Teausant—raised Catholic, he later converted to Islam—had suggested action. He once disclosed to the same contact that he was considering "hitting" Los Angeles on New Year's Day 2014. "Don't go to LA Anytime soo[n]," he texted. "Please trust me on this...and if you



Illustration by MATTHEW HOLLISTER

do go don't use the subway." Eventually, Teausant concocted a plan to join the Islamic State. On a March night in 2014, the 20-year-old, his head shaved beneath a black-and-white kufi—a short, brimless, rounded cap often worn by Muslims—took a train to Sacramento and then another to Seattle. There, he got on a bus to Canada, where an Islamic State contact had supposedly arranged a flight from Vancouver to Syria.

But Teausant's journey ended at the U.S.-Canadian border, where he was handcuffed by police. His arrest was not a coincidence: The contact he had been texting was actually an undercover FBI informant, and the Islamic State liaison was also someone at the bureau. The FBI has about 15,000 paid informants on its books, according to a 2008 budget request; most spend their days searching websites for people like Teausant and making contact in order to build cases against them. (Teausant, who was initially identified after posting angry comments on Facebook and Instagram, among other places, is now facing trial. His attorney has announced that he has been diagnosed with schizophrenia.)

The informant system, in other words, worked. But Teausant's case also highlights what many terrorism experts and intelligence officials fear is a new threat over which they have little control: the growing influence of *Inspire*. "It's the branding of al Qaeda. It's glamorous," a former CIA clandestine intelligence officer posted to Yemen told me. Bruce Hoffman, a professor and terrorism researcher at Georgetown University, has called *Inspire* the "*Vanity Fair* of jihadi publications." And Frank Cilluffo, director of George Washington University's Center for Cyber and Homeland Security, told a congressional hearing in 2013, "I think [AQAP's] greatest hallmark has been *Inspire* magazine and the role that it plays in radicalizing and lone-wolf jihadists, especially in the West."

TO PUT THIS IN ANOTHER PERSPECTIVE, BECAUSE I DOWNLOADED ALL 13 ISSUES OF *INSPIRE* PUBLISHED TO DATE AS RESEARCH FOR THIS COLUMN, IN THEORY I COULD GET 130 YEARS IN PRISON IN BRITAIN AND NEARLY 200 YEARS IN AUSTRALIA.

LONG BEFORE THE TEAUSANT CASE, the magazine, which is now in its sixth year of publication, had been a focus of intelligence officials and members of Congress. In 2011, the House Homeland Security Committee and in particular Republican member Peter King had expressed concern that people in the military could download it. "We have learned," King said at a hearing, "that, for instance, in barracks … *Inspire* magazine is available to members of the armed forces." A witness, a senior Army counterintelligence official, agreed: "That is one of those behavioral indicators that we want soldiers to report, when they observe other soldiers reading *Inspire*."

Many officials have also noted *Inspire*'s possible connections to the Boston Marathon bombing and the recent attack on *Charlie Hebdo*'s office in Paris. According to a U.S. Defense Department report, Tamerlan and Dzhokhar Tsarnaev, the brothers behind the marathon plot, "learned how to make bombs from the *Inspire* magazine article: 'Make a bomb in the kitchen of your Mom.'" And *Inspire*'s spring 2013 issue featured an article titled "Wanted Dead or Alive for Crimes Against Islam" that included a picture of Stéphane Charbonnier, *Charlie Hebdo*'s editor. During the attack on the magazine this January, which killed 12 people, including Charbonnier, one of the gunmen asked for him by name.

Alarmed, Western governments are scrambling to stop the magazine from finding readers. The first line of defense is closing websites on which the magazine is published—but the effect is limited. Robert Grenier, former chief of the CIA's Counterterrorism Center, told me, "You can shut down a site, but they have so many options available to them that it will quickly pop back up somewhere else, so it really is something like whack-a-mole."

This strategy has also spurred a heated debate about freedom of speech, including proposals for censorship that would be more at home in China. In 2013, Democratic Congressman Adam Schiff suggested suspending the right to free speech when it comes to *Inspire*. "I don't think al Qaeda has a First Amendment right to put out its propaganda, to encourage people to commit acts of terrorism," he told the *Washington Post*. This January, attorney Martin London wrote an op-ed in the *New York Times* in which he asked, "Is this publication protected by our First Amendment? Not on your life!" The federal government, he said, should "move decisively →

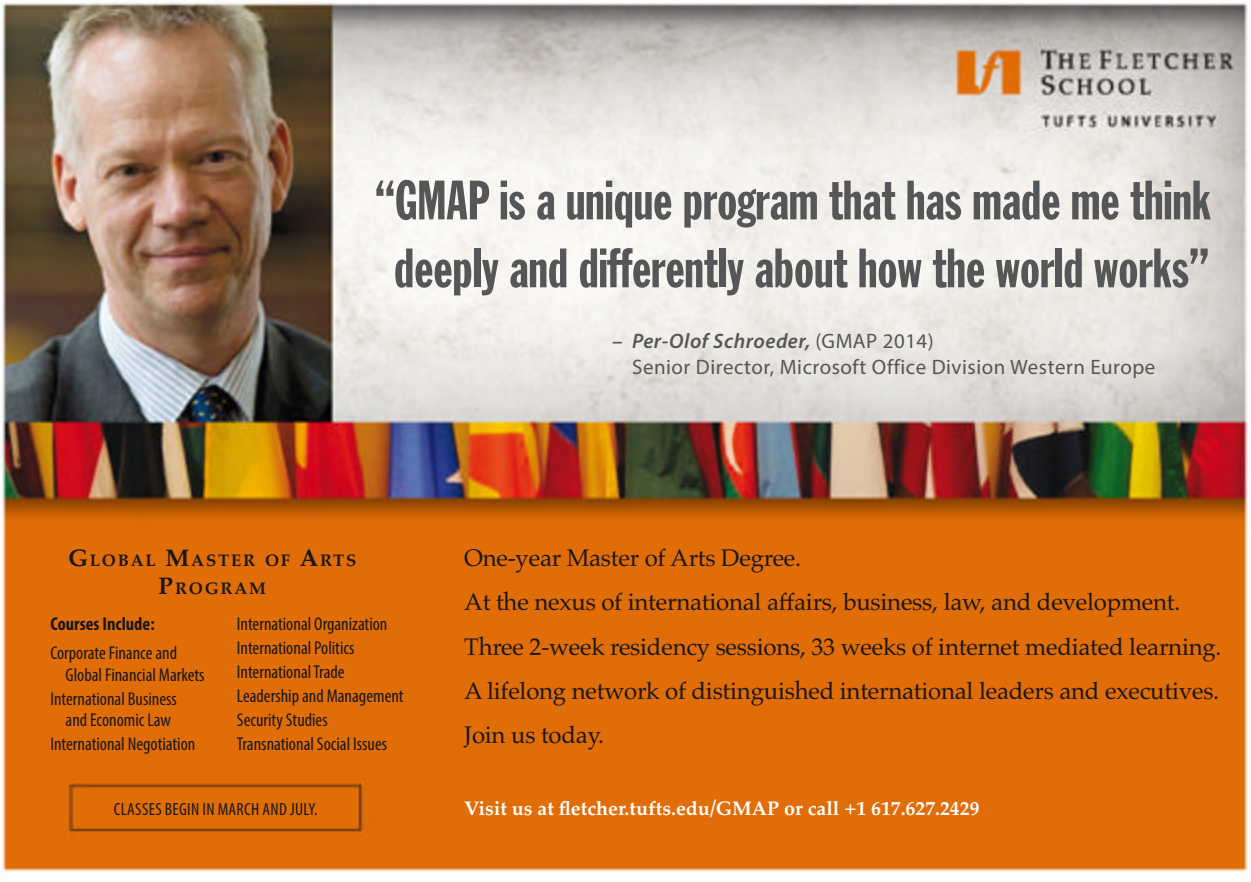
to block *Inspire* on the web. It is criminal incitement that has produced lawless action, and no sentient judge would today say otherwise." London called anyone who opposes drastic action "First Amendment fundamentalists." The suggestion, however, alarmed Marty Lederman, a professor at the Georgetown University Law Center. "Mr. London does not specify what 'actions' he believes the Attorney General should take 'against' *Inspire*," Lederman wrote on the blog *Just Security*. "Criminal prosecution of publishers? of readers? mailing restrictions within the U.S.? asking allies to shut down servers? some form of cyber-sabotage?"

Elsewhere, some governments have already gone to extremes, including taking a page out of George Orwell and jailing people who dare read so much as a single paragraph of *Inspire*. In the United Kingdom, the police are tracking down anyone who pulls the publication off the web. According to a May 2013 article in London's *Times*, "Downloading *Inspire* has led to more than 20 people being arrested and prosecuted in Britain in the past 18 months." Possession of the magazine is enough to lead to arrest under Section 58 of Britain's Terrorism Act 2000. (A broad law granting sweeping powers to law enforcement, the act prohibits possession, without a "reasonable excuse," of something useful to a terrorist and carries a sentence of up to 10 years in prison.) Even journalists doing research are not necessarily protected. "We wouldn't say just because you were doing it for journalistic purposes you would be immune. You have to be careful," a spokesman for Scotland Yard told the *GlobalPost*.

Australia has enacted a similar law, and in 2011, the country's then intelligence chief, David Irvine, said that *Inspire* is of great concern because it is "intended to resonate with a youthful, audience: the i-jihad generation. It sends them a simple message: 'Jihad—just do it!'" One person arrested for possessing *Inspire* was Melbourne resident Adnan Karabegovic. In 2012, the then 23-year-old was charged with having six issues of *Inspire* on his computer and faced 90 years in prison. The court eventually dismissed five of the counts against him, but Karabegovic is now awaiting trial for the single count, which could still cost him 15 years.

To put this in another perspective, because I downloaded all 13 issues of *Inspire* published to date as research for this column, in theory I could be facing 130 years in prison in Britain and nearly 200 years in Australia.

PICTURES OF MUSLIMS being tortured at Abu Ghraib, humiliated at Guantánamo Bay, and slaughtered by the thousands in Gaza and by the tens of thousands in Iraq are all powerful weapons in the hands of a good editor. Especially an editor with a devoted following and an online magazine unstoppable by jet fighters, guided



THE TRUE THREAT COMES FROM *INSPIRE*'S ABILITY TO DELIVER TO MUSLIMS THE MESSAGE THAT THEY ARE UNDER CONSTANT ASSAULT AND THE ONLY THING LEFT TO DO IS TO FIGHT BACK WHEREVER AND HOWEVER THEY CAN.

missiles, and even cyberweapons. That is why the United States has targeted the editors of *Inspire*. The idea goes, if the head is cut off, the body dies.

The success of *Inspire*'s founding editors—Anwar al-Awlaki, a Muslim cleric born and educated in the United States, and Samir Khan, another American and an expert in digital graphics—placed large bull's-eyes on their backs. On Sept. 30, 2011, a CIA drone pilot found his mark, killing them both with Hellfire missiles. It was the first time in U.S. history that Americans had been deliberately targeted and killed without even a trial.

But if the CIA thought that assassinating the two editors would destroy the magazine, they were in for a surprise. "Although the original authors and publishers of *Inspire* ... are now deceased," Cilluffo, of the Center for Cyber and Homeland Security, told the House panel in a statement, "the magazine continues and its production values have improved recently." *Inspire* is now run by Yahya Ibrahim, a mysterious individual whose use of English vernacular is as good as that of Awlaki and Khan, leading many to suspect that his name is simply a nom de guerre and that he also may be an American. Worse, as someone who recommends launching a "botulin attack" that could kill "hundreds if not thousands," and building a human "mowing machine"—a pickup truck with steel blades welded onto it at headlight level, sped through a crowd "to strike as many people as possible"—he is considered far more violent and radical than his predecessors.

Wasting little time following the assassination of Awlaki and Khan, Ibrahim turned out a new issue of *Inspire* in May 2012. "To the disappointment of our enemies, issue 9 of *Inspire* magazine is out against all odds," said one of the articles. "[W]e are still spreading the word and we are still publishing America's worst nightmare." An →

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indication of the turn to a more hard-line approach came from another senior member of AQAP, Ibrahim al-Rubaish, writing in the same issue: "[Awlaki's and Kahn's] writing with the ink is replaced now with writing with their blood. And this is what will have a greater impact."

RUBAISH'S WORDS ARE a reminder that the real danger with *Inspire* is not the show and tell on the pages. Anyone who wants to build bombs can easily find instructions elsewhere on the web. The true threat comes from *Inspire*'s ability to deliver to Muslims the message that they are under constant assault and the only thing left to do is to fight back wherever and however they can. "We fight you because you attacked us and continue to do so," wrote the author of a recent *Inspire* article, directing his words at Americans. "The American people pay the taxes that pay for the planes which bomb us in Afghanistan, the tanks that demolish our houses over our heads in Palestine, the armies which occupy us on the Arabian Peninsula, and the navies that surround our children in Iraq, taxes that go to Israel so that it can continue to attack us and confiscate more of our land." In other words, a violent magazine is responding to, and in many ways capitalizing on, a violent U.S. foreign policy.

A hallmark of that foreign policy has been overreaction. America responded to the 9/11 attacks by invading Iraq, only to discover that Saddam Hussein had palaces of mass luxury, not weapons of mass destruction. The results were the deaths of, perhaps, hundreds of thousands of innocent Iraqis, the loss of thousands of American soldiers, and the waste of a trillion dollars or more. Then the country overreacted to the threat of terrorism by engaging in torture and secretly unleashing the National Security Agency to conduct mass surveillance of Americans.

Now, the United States may be teetering yet again toward overreaction, this time with regard to *Inspire*. Given the recent, sharp right turn in Congress, it might not be so wild to think that legislation similar to that in the United Kingdom and Australia might follow, allowing the state to jail people simply for reading. Republicans, however, aren't the only risks: Congressman Schiff, who suggested that the First Amendment shouldn't apply to *Inspire*, is now the most senior Democrat on the House Intelligence Committee.

Excessive regulation would be unacceptable in the United States. If Americans have to live with the danger of guns because of the Second Amendment, then they'll also have to live with the danger of publications like *Inspire* because of the First Amendment. To paraphrase an old pro-gun slogan: Words don't kill people—people kill people. ■

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AT THE DAWN OF THE NUCLEAR AGE, NATIONAL SECURITY OFFICIALS COULD NOT WIN TOP JOBS WITHOUT KNOWING THE LANGUAGE OF NUKES. IN CONTRAST, TODAY THE VAST MAJORITY OF THESE OFFICIALS ARE CYBER-ILLITERATE.

CONTINUED FROM PAGE 73

age and usher in a world where the danger of the intentional or accidental use of nukes would be substantially higher than at any time in the past 70 years.

But in a further twist, of all the threats associated with Iran's nuclear program, perhaps one of the greatest is distraction. At the end of the day, the long-tail risk of a low-probability, high-cost event draws down the world's diplomatic and security bandwidth heavily.

With a country like Iran, this can be especially dangerous. Tehran has been doing pretty well causing trouble in the Middle East for the past three and a half decades without the bomb—and no nuclear deal will address this problem. In fact, were a deal to produce a rapprochement with Iran and a dropping of all or some of the sanctions that have burdened its economy, in a practical sense Tehran might become considerably more dangerous than it has been: It would have more money for its state sponsorship of terrorism, for example, and gain more stature in the international community.

Already, Washington has devoted so much effort to pursuing a nuclear deal that it has incidentally empowered Tehran in the Middle East. In Iraq, the United States has effectively been flying air support for Iranian-led or -assisted missions against the Islamic State; Tehran gets credit, and the government in Baghdad, which appears to be more beholden to Iran than ever, is strengthened too. Washington has softened its stance on Iran's client and friend, Syrian President Bashar al-Assad, ensuring that Tehran maintains a foothold in Syria (where the United States is also working to destroy Assad's enemies). And in Yemen, America did not attempt to push back in a meaningful way against the Houthi coup that has left a Shiite group, with ties to Iran, in a position of enhanced power. These geopolitical gains will have long-lasting consequences for the United States and may present greater risks, day in and day out, than those posed by Iranian nukes.

Of course, Washington isn't alone in being guilty of distraction: Iran's government is too. Iranian leaders could be doing more for their people, in the face of nationwide economic troubles, if precious resources were not directed toward a nuclear program. Meanwhile, Israeli officials have made a great show of declaring the threat of an Iranian bomb as "existential"—partly, it seems, to distract from their inability to deal with the more imminent peril caused by the changing demographics within their claimed borders.

Other risky technologies are also being neglected. Unlike nukes, for instance, cyberweapons are so low cost that constant, web-based conflict seems a real and destabilizing possibility.

At the dawn of the nuclear age, national security officials could not win top jobs without knowing the language of nukes. In contrast, today the vast majority of these officials are cyber-illiterate. The world thus finds itself ill-prepared to deal with both the morphing threats of old technology and the emerging threats of new ones.

The right nuclear deal with Iran, if honored, monitored, and effectively enforced, might reduce the real risk of a dangerous turn for the worse in the nuclear age. It is a worthy goal and should be pursued, as should the establishment of a new nonproliferation regime with much greater enforcement capabilities. The costs of failure on such efforts are clearly enormous. But one lesson of the past 70 years has been what happens when the Atomic Age has a country looking and devoting its precious resources too heavily in one direction. I worry that, in making a deal with Iran on nuclear weapons its No. 1 national security priority, the Obama administration may be overlooking or exacerbating other problems that will haunt America and the Middle East for years to come. As was the case in 1945, and as it has been ever thus, the Jornada del Muerto is paved with good intentions. ■

DAVID ROTHKOPF (*@djrothkopf*) is CEO and editor of the FP Group.

by OWEN MATTHEWS



Pasternak's Shadow

Are Western readers averse to contemporary Russian literature?

Speaking at an event in January to launch the "Year of Literature," a series of public events and projects extolling the virtues of Russian letters, President Vladimir Putin laid out his mission to raise the "prestige and influence in the world" of his country's writers. Generations of American readers weaned on Leo Tolstoy and Boris Pasternak may see cause for hope in such a revival: They want to return to that magical land they first discovered in books—one of passion and tragedy where vast forces tumble characters like ice cubes in the 11-time-zone-wide cocktail shaker that is Russia. Yet though nostalgic for Natasha Rostova and Yuri Zhivago, those readers might struggle to name a single contemporary Russian writer.

The last Russian novel to become a genuine American sensation was *Doctor Zhivago*, which was published the year before Pasternak won the 1958 Nobel Prize in literature. The most recent nonfiction book of comparable fame was Aleksandr Solzhenitsyn's *The Gulag Archipelago*, which was published in the West in 1973. Since then, no Russian writer has enjoyed true breakout American celebrity.

Noble efforts to translate and promote Russia's contemporary literature persist, but today in the United States, only about 4.6 percent of books translated into English were written in Russian, placing the language far behind French, Spanish, and German. "Great books are being written in Russia today," Dmitry Bykov, Russia's leading contemporary critic and a biographer of Pasternak, said in a radio interview. "But not nearly enough get translated."

Putin biographer and journalist Masha Gessen disagrees, saying the reason for limited international interest is that modern Russian writers aren't producing world-class books. Russian literature "is not as popular because there is very little to read," says Gessen. Russia's "general cultural rot has affected literature to an even greater extent than other cultural production." Chad Post of the Three Percent translation project at the University of Rochester provides a more benign explanation: "poor distribution networks" in the United States. But Natasha Perova, whose famous Moscow publishing house, Glas, announced it was suspending work in late 2014, says the American market is more to blame. These days, people buying from Perova's U.S. distributors "seem to have an allergy to everything Russian," she says. In the early 1990s, "everything Russian was welcome because the world had great hopes for Russia. We thought Russia would be

Illustration by EDMON DE HARO

reintegrating into the European context. But it gradually went back to its former practices, and people turned away from us."

A glib case can be made that characters in Russian novels are incomprehensible to a new generation of Western readers—like the chemotherapy patients in Solzhenitsyn's 1967 *Cancer Ward*, changed forever by the poison they have ingested, Russians' lives have become too grim to elicit immediate empathy. The #FirstWorldProblems suffered by the suburban protagonists of writers like Jonathan Franzen, the argument goes, are nothing like the avalanches of despair that their Russian contemporaries face. To be sure, being set in a violent, feudal, and unfamiliar world is not necessarily an impediment to a book's U.S. sales; just look at Hilary Mantel's Thomas Cromwell cycle. In that case, however, the reader's guide is Cromwell, constructed by Mantel as an outsider—a man of almost modern sensibility projected into a late medieval world.

Perhaps that need for a detached perspective is why many of the Russian authors best known to Western readers are themselves Westernized. Boris Fishman and Gary Shteyngart, for example, are now New Yorkers. Russian author Mikhail Shishkin is lavishly praised in the West and widely translated, but he lives, at least in part, in Zurich. The brilliance of his 2005 novel, *Maidenhair*, lies in his skewering of the disconnect between hardscrabble Russia and bourgeois, defenseless, self-satisfied Switzerland. And his masterly latest novel, *The Light and the Dark*, reflects not Russia's complex present, but its past: During the 1900 Boxer Rebellion in China, a soldier's love letters transcend time and place.

Offering another theory of why so few Russian books find Western readers, Will Evans, a translator and founder of the Dallas-based Deep Vellum Publishing, says Americans "read Russia" in a particular way. Given the Cold War and its unsettled aftermath, American readers tend to "politicize [Russian literature], read it for big ideas and political insight." Indeed, just as in the mid-20th century, when superpower politics were projected onto Pasternak, some of the new Russian authors best known in the West carry political freight. Zakhar Prilepin, for example, whose novels *Sin* and *Sankya* were published recently in English, is a former paramilitary police officer who did tours in Chechnya and became a radical opposition activist. Then, after Russia's annexation of Crimea last year, he surprised his admirers by praising the volunteers in Novorossiya (eastern Ukraine). His hyperrealist depiction of the cynical post-Soviet generation "in search of fathers" in *Sankya* is sharp and vital, and he has drawn comparisons to Tolstoy.

Tellingly, some Western readers are also drawn to surreal visions of Russia: Many books making it into English translation today conjure horrific dystopias. In one of the tales in young Muscovite Anna Starobinets's debut collection of short horror stories, *An Awkward Age*, Moscow has been destroyed by a war between humans and androids. And veteran satirist Victor Pelevin's work, *The Helmet of Horror*, creates a nightmarish world where characters who meet in an Internet chat room find themselves trapped in a virtual labyrinth.

IN THE PAST, RUSSIANS LOOKED TO THEIR LITERATURE FOR A DESIGN AND PHILOSOPHY OF LIFE.

For all their virtue, though, modern Russian works may never satisfy the nostalgia that Americans harbor for the crowd-pleasing grandeur of bygone writers' novels. This may have something to do with the fact that Russia's literary culture has changed. Russia still produces more books than most other countries: Some 120,000 new titles were published in Russian in 2013, according to government figures. But today, Russia's writers are content providers vying for attention in a vibrant marketplace of entertainment and information. In the past, Russians looked to their literature for a design and philosophy of life. The stern God of Russian Orthodoxy provided an immutable baseline of good and evil, but authors were the country's spiritual legislators. In the works of Tolstoy and Fyodor Dostoyevsky, Alexander Pushkin and Anton Chekhov, Russians found their moral nuts and bolts, wrestling with the forces of history that threatened to break them apart. Writers, in short, were asked to live more deeply than ordinary mortals.

Today, Putin's promised renaissance notwithstanding, Russian writers are no longer deified at home, let alone abroad. Yet at least the right to publish in Russia holds good; in comparison with the centuries that came before, the past 23 years have been largely free of censorship. Even if Russia is now entering another cycle of oppression, writers will be there to document every turn of the screw—and the best among them will produce classics. ■

OWEN MATTHEWS (*@owenmatth*), author of *Stalin's Children*, was *Newsweek*'s Moscow bureau chief from 2006 to 2012.

interview by PAUL RIMPLE • photographs by JUSTYNA MIELNIKIEWICZ

Tbilisi, Georgia

Dimitri Bit-Suleiman on where to take a sulfur bath and how to give a proper, impassioned Georgian toast.



WHERE TO RELAX: THE SULFUR BATHS are actually the oldest part of Tbilisi. In the fifth century, King Vakhtang Gorgasali moved the capital here because of the springs. And this is how Tbilisi gets its name: *Tbili* means "warm" in Georgian. You get a wash and a *kese*, which is a scrub with an old piece of wool carpet. Then, at the baths, you get a massage that opens up your muscles and your bones, and you soak again.
GULOS ABANO
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IN TBILISI'S HISTORIC DISTRICT of Sololaki, an old man sells homemade wine and spirits inside a tiny brick cellar bedecked with Georgian Orthodox icons. His sales supplement his meager pension of around $80 a month. Meanwhile, perched on the hilltop above him is a $50 million glass-and-steel mansion created by Japanese designer Shin Takamatsu for Bidzina Ivanishvili, Georgia's richest man. This is just one example of what 37-year-old Dimitri Bit-Suleiman calls "Tbilisi style": the intersection—in architecture, food, and art—of old and new.

Tbilisi, the Georgian capital and a centuries-old crossroads of East and West, has about three times the square footage of Paris, but with just over 1 million people, it feels like a small town. The rumor mill is fervid, and residents think nothing of stopping traffic to chat with a friend in the street.

Bit-Suleiman, known as Dima, has been a fixer since 2000. While working for a local newsweekly, he met a German journalist and offered to serve as a guide for a story on Chechen refugees. (In addition to Chechnya, post-Soviet Georgia also touches or encompasses—depending on whom you ask—other disputed regions, including Abkhazia and South Ossetia.) "Later, I found out that people actually pay for that service," Dima says.

Since then, fixing has been a fortuitous side gig while Dima flips between odd jobs. His busiest stretch was the August 2008 war, which pitted the Western-friendly government of then-Georgian President Mikheil Saakashvili against that of Russia's Vladimir Putin.

These days, Dima mostly considers himself an entrepreneur; he is launching a tea-production business and manages a village guesthouse where foreigners "can live like locals." Still, the fourth-generation Tbilisian took time during a recent afternoon to show FOREIGN POLICY the ins and outs of his ever-transforming home city.



WHERE TO EAT: RACHIS UBANI AND MASPINDZELO. At Rachis Ubani at the Open Air Museum of Ethnography, order the *shashlik* (broiled meat on a skewer) and all the veggie stuff, like the *pkhali* (vegetables mixed with walnuts), and *badridzhani* (eggplant with walnuts). Maspindzelo is simple, but good. It's open 24/7. You go for the *khinkali* (boiled meat dumplings) and for *khashi* (tripe soup) at 4 a.m. to avoid a hangover.
RACHIS UBANI
(+ 995 32) 272 90 45
MASPINDZELO
(+995 32) 2 30 30 30

WHAT TO WATCH: *CORN ISLAND* AND *TANGERINES*. Two Georgian-directed films were shortlisted for best foreign-language film at the Oscars: *Corn Island* by Giorgi Ovashvili and *Tangerines* by Zaza Urushadze. Both are set during the war in Abkhazia. Not everybody likes these movies. Some disagree with the historical content or disapprove of a stereotype being portrayed.

LOGISTICS

DINNERTIME
8 p.m. and after.

SPENDING PER NIGHT
It depends on the occasion and the people: anywhere from $50 to $500.

CULTURAL FAUX PAS
At dinner, foreigners order one dish for themselves, but in Georgia, each dish is supposed to be shared. Also, foreigners should learn how to make a Georgian toast before attempting one.

WHAT'S A GEORGIAN TOAST?
It covers all themes: love, hate, poetry, life, death. It has its own rules, melody, and meaning. Like, if you want to make a toast to "us," you might start with "once upon a time" and go on to tell a story about "long ago, before mankind, there were only birds and their biggest treasure was a pearl necklace. The two birds fought over the necklace, and it broke. The pearls fell onto the ground, and later they transformed into beautiful people. Let's drink to the pearls sitting at this table ..." and so on.







WHERE TO EAVESDROP: PUR PUR is a fancy, comfortable place where you can even hold negotiations, which the Saakashvili administration did a lot. They took Condoleezza Rice there once. Today, you'll see officials at the Marriott; it's where most diplomats stay.
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WHERE TO TAKE IN CULTURE: GABRIADZE THEATRE. Walk from the historic Maidan square, past the Sioni Cathedral, down Erekle II Street to the Patriarchy [home of the Georgian Orthodox Church], and end at Gabriadze's cafe and the Anchiskhati Basilica, the oldest church in Tbilisi. Gabriadze is a puppet theater and is one of a kind; I once saw John Malkovich and Charlotte Gainsbourg there.
GABRIADZE.COM

WHERE TO FIND AN ARCHITECTURAL GEM: THE BRIDGE OF PEACE, designed by Italian architect Michele De Lucchi and built in 2010, is my favorite. When the new government came into power in 2012, they talked of moving the bridge across the country because Saakashvili built it—and they hate Saakashvili. But so far, it's still here.

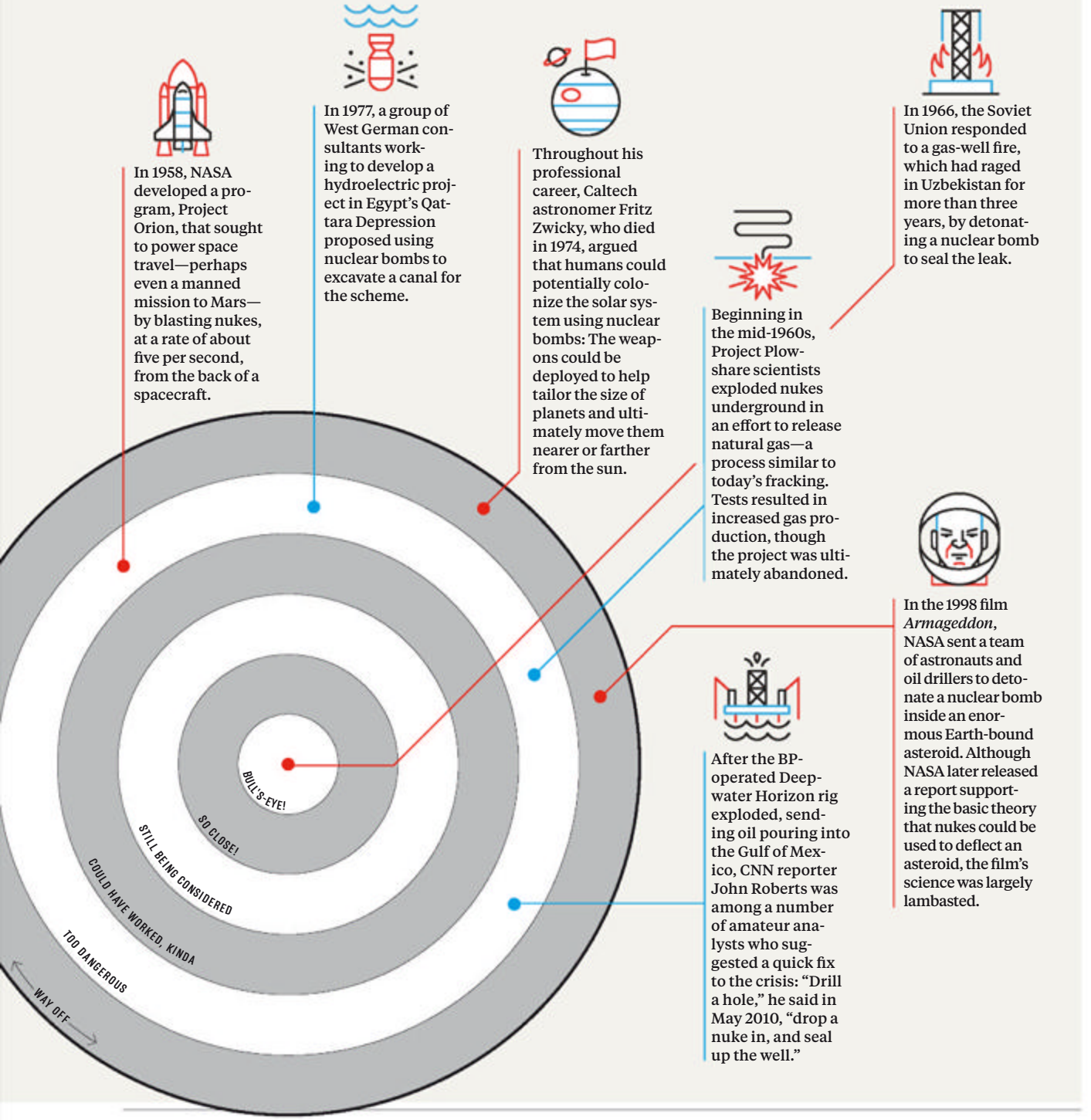




WHERE TO SEE AND BE SEEN: THE ROOMS HOTEL TBILISI, where the elite go to dine and drink good wine. Most of the crowd is under 50. A couple of paintings from [Georgian contemporary artist] Eteri Chkadua hang on the wall. The Georgian composer Dato Evgenidze is always there. You feel like you are more in New York than Paris.
ROOMSHOTELS.COM

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by JAKE SCOBEY-THAL



In 1957, 12 years after the United States dropped Fat Man and Little Boy over Japan, scientists from the University of California and the now-defunct U.S. Atomic Energy Commission established a program to repurpose the country's nuclear arsenal. The goal? To harness the explosive energy of the atom for future civilian use. Project Plowshare, as it was dubbed, sought to develop peaceful applications for nuclear bombs, from gas exploration to subterranean storage. And with that, an international trend was born. For decades afterward, scientists, policymakers, and even a group of screenwriters envisioned ways—ranging from the fantastical to the feasible—to use the world's greatest weapon beyond the battlefield. Although some proved too extreme, others have been realized.

Illustrations by ELIAS STEIN



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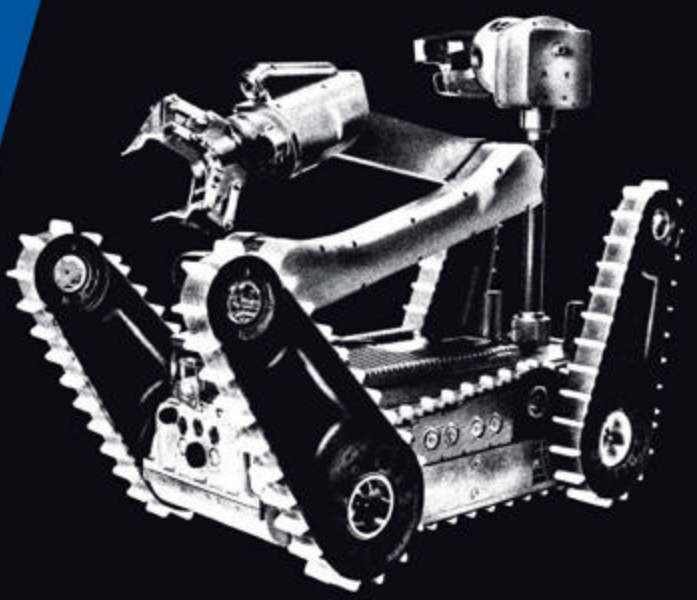
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